# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advertisement for Bid</td>
<td>2</td>
</tr>
<tr>
<td>Invitation to Bid</td>
<td>3</td>
</tr>
<tr>
<td>Information to Bidders</td>
<td>5</td>
</tr>
<tr>
<td>Bidder’s Check List</td>
<td>11</td>
</tr>
<tr>
<td>Standard Bid Bond</td>
<td>17</td>
</tr>
<tr>
<td>First Tier Subcontractor Disclosure Form Instructions</td>
<td>18</td>
</tr>
<tr>
<td>First Tier Subcontractor Disclosure Form</td>
<td>19</td>
</tr>
<tr>
<td>Employee Drug Testing Program</td>
<td>20</td>
</tr>
<tr>
<td>Public Works Bond - Pre-Bid Notice and Certification</td>
<td>21</td>
</tr>
<tr>
<td>Construction Contract</td>
<td>22</td>
</tr>
<tr>
<td>Standard Contract Provisions</td>
<td>24</td>
</tr>
<tr>
<td>Public Works Bond Filing Certification</td>
<td>31</td>
</tr>
<tr>
<td>Standard Performance Bond</td>
<td>32</td>
</tr>
<tr>
<td>Payment Bond</td>
<td>34</td>
</tr>
<tr>
<td>Lowest Bidder Responsibility Determination Form</td>
<td>36</td>
</tr>
<tr>
<td>Prevailing Wage Rates for Public Works Contracts</td>
<td>38</td>
</tr>
<tr>
<td>General Conditions</td>
<td>39</td>
</tr>
<tr>
<td>Technical Provisions</td>
<td>79</td>
</tr>
</tbody>
</table>
CITY OF ROSEBURG
ADVERTISEMENT FOR BID

Project Name: Chlorination System Improvements
Project Number: 19WA03
Project Description: The City of Roseburg currently uses a mixed oxidant system for disinfection which is generated on-site. Since this system is aging and becoming increasingly difficult to maintain, the City desires to replace the existing mixed oxidant system with a bulk 12.5-percent sodium hypochlorite feed system. This project includes the demolition of the existing mixed oxidant system and the installation, testing, start-up and training services of the proposed bulk sodium hypochlorite feed system equipment.

Non-Mandatory Prebid Meeting: September 10, 2019, 11:00 a.m.
Water Treatment Plant
180 Pioneer Way
Winchester, OR  97495

Bids are due by 2:00 p.m. on September 24
All bids will be opened at 2:00 p.m.
Additional forms disclosing first tier subcontractors are due by 4:00 p.m.
No bids shall be received after this date and time.

Contact – Submit bids to: City of Roseburg City Recorder
900 SE Douglas
Roseburg OR  97470
(541) 492-6866
Address Technical Questions to: Barney Santiago, PE, RH2 Engineering, Inc.
22722 29th Drive SE, Suite 210
Bothell, WA  98021
(425) 951-5456
bsantiago@rh2.com

SOLICITATION DOCUMENTS: Solicitation documents, including contract terms, conditions, specifications, all attachments and/or addenda for the Invitation to Bid are available for review at the above contact address. Bid documents will not be mailed to prospective bidders, but may be downloaded from the Oregon Procurement Information Network (ORPIN) through the following internet address: http://orpin.oregon.gov/open.dll/welcome. Bidders without access to ORPIN may download the documents at a Plan Center or the City of Roseburg’s website at www.cityofroseburg.org under “Bidding Opportunities.”

Bidders must be pre-qualified in accordance with the laws of Oregon and the Information to Bidders at least ten days prior to the date of bid opening. Bidders must be licensed with the Oregon Construction Contractors Board and comply with City of Roseburg Municipal Code.

The resulting public works contract is subject to ORS 279C.800 to 279C.870 or the Davis-Bacon Act (40 U.S.C. 3141 to 3148). No bid will be considered unless the bid contains a statement that the bidder will comply with the provisions of ORS 279C.840 (Prevailing Wage Rates).
INVITATION TO BID

The City of Roseburg will receive sealed bids marked "Bid for Chlorination System Improvements, Project No. 19WA03" until the hour of 2:00 p.m. on Tuesday, September 24, 2019, at which time they will be publicly opened and read. When required by ORS 279C.370, bidders must submit a list of their first-tier subcontractors providing labor, or labor and materials, no later than 4:00 p.m. that same day. Bids shall be addressed and delivered to Amy L. Sowa, City Recorder, City Hall, 900 SE Douglas Avenue, Roseburg, Oregon 97470. Any and all bids received after the 2:00 p.m. deadline for submission, or for which the list of first-tier subcontractors has not been submitted by 4:00 p.m. that same day, shall be considered nonresponsive and returned to the bidder. All bidders must list their "Construction Contractors Board" or "State Landscape Contractors Board" license number as required by ORS 701.021 or 671.530 on the bid form.

The proposed work generally consists of furnishing all labor, equipment, materials and supervision for the construction of: a proposed bulk sodium hypochlorite feed system within the existing water treatment plant, the demolition of the existing mixed oxidant system and the installation, testing, start-up and training services of the proposed bulk sodium hypochlorite feed system equipment together with appurtenant piping, valves, fittings and related work. The bids will be evaluated as lump sum without additive or deductive alternates pursuant to OAR 137-049-0380(2)(a). The proposed work will require the bidder to meet the highest standards prevalent in the industry or business related to the work to be performed. Failure to meet such standards may result in a reduction or withholding of payment; require bidder to provide, at bidder’s own expense, additional work required to meet such standards; or termination of the contract, with damages being sought. Technical questions regarding the work to be performed should be addressed to:

Barney Santiago, PE, RH2 Engineering, Inc.
22722 29th Drive SE, Suite 210
Bothell, WA 98021
(425) 951-5456
bsantiago@rh2.com

Bids must be accompanied by a certified check, cashier's check, irrevocable letter of credit or Bid Bond in an amount equal to not less than ten percent (10%) of the total amount of the bid. Bidders shall state as part of the bid that the provisions of ORS 279C.800 to 279C.870 (Prevailing Wage Rates) shall be complied with; provided however, if the project is subject to the federal prevailing rates of wage under the Davis-Bacon Act (40 U.S.C. 3141 et seq.) or if the project is subject to both the state and federal prevailing rates of wage, the bid must contain a statement by the bidder that contractor and every subcontractor shall pay the higher of the applicable state or federal prevailing rate of wage to all workers on the project. Bidders must also certify as part of the bid that the requirements of ORS 279C.505(2) (Employee Drug Testing Program) shall be complied with. Bidders must be pre-qualified in accordance with the laws of Oregon and the Information to Bidders. Each bid must contain a statement as to whether the bidder is a resident bidder, as defined in ORS 279A.120. Bidders are not required to be licensed under ORS 468A.720 (Asbestos Abatement). However, the successful bidder shall at all times during the project provide qualified staff on site that is able to identify asbestos containing material. Bidders are hereby notified there are underground pipelines and structures containing asbestos within the City of Roseburg. If any such material is encountered...
during the project, the bidder shall thereupon be required to notify the City and comply with all requirements of applicable laws and regulations. Unless exempt under ORS 279C.800 to 279C.870, the successful bidder must file a $30,000 Public Works Bond with the Construction Contractors Board prior to beginning work on the project, and certify that all sub-contractors have also filed such bond. Bidders must agree to use recyclable products to the maximum extent financially feasible.

The City of Roseburg may reject any bid not in compliance with all public bidding procedures and requirements, including the requirement to demonstrate the bidder’s responsibility under ORS 279C.375(3)(b), may waive any irregularities, and may reject for good cause any or all bids upon a finding of the City it is the public interest to do so. The City may also cancel this invitation in accordance with OAR 137-049-0270.

Dated this 28th day of August, 2019.

CITY OF ROSEBURG, DOUGLAS COUNTY, OREGON
/s/ Amy L. Sowa, City Recorder
INFORMATION TO BIDDERS

1. FORM OF BID

All bids must be made upon the blank Bid Form attached hereto and must give a price for each item and an aggregate amount or a lump sum price as required in the Bid Form.

The City reserves the right to reject any or all bids or to accept the bid deemed in the best interest of the City. Without limiting the generality of the foregoing, the City may reject any bid which is incomplete, obscure or irregular; which omits any one or more items in the price sheet; in which unit prices are obviously unbalanced; or which is accompanied by an insufficient or irregular Bid Bond.

The bidder shall sign the Bid Form in the blank space provided therefore. All bids must contain the bidder’s tax identification number. Bids made by a corporation, general or limited partnership, or L.L.C., shall contain the name and address of such organization, together with names and addresses of officers, partners or managing members. If the bid is made by a corporation, it must be signed by one of the corporate officers with the authority to sign for the corporation; if made by a partnership, by one of the partners.

All bids must be submitted at the time and place, and in the manner prescribed in the Invitation to Bid.

2. BID PROTEST; REQUEST FOR CHANGE OR CLARIFICATION

A bidder may protest, or request a change in items in the bid documents, including contract terms and conditions or specifications, by filing a written protest with the City not less than ten (10) calendar days prior to the bid submission deadline. Such written protest or request for change must include a detailed statement of the grounds for the protest and a statement of the desired changes to the contract terms and conditions or specifications.

The City shall not consider a bidder’s protest or request for change after the deadline for submitting such protest or request. The City shall provide notice to the bidder if it entirely rejects the bidder’s protest or request for change. If the City agrees with the bidder’s protest or request, in whole or in part, the City shall issue a written Addendum to the bid documents or specifications.

Prior to the deadline for submitting a written protest or request for change, a bidder may request that the City clarify any provision of the bid documents. The City’s clarification to a bidder, whether orally or in writing, shall not change the bid documents and is not binding on the City unless the City amends the bid documents by issuing a written addendum.

If a written addendum is issued by the City, all bidders must provide written acknowledgement, with their bids, of receipt of all issued addenda.

3. CONTRACT DOCUMENTS
The Contract Documents for this Project consist of, but are not necessarily limited to, the Invitation to Bid, Information to Bidders, Bid Form, Construction Contract including Exhibit “A” Standard City Contract Provisions, First-Tier Subcontractor Disclosure Form, Drug Testing Program Certification Form, Bidder’s Responsibility Form, Performance Bond, Payment Bond, Public Works Bond Filing Certification form (when required), General Conditions, Technical Provisions, Special Conditions, Standard Drawings, Specifications and Plans and Supplemental Specifications, all as required for the full execution and satisfactory completion of the Project. Any person contemplating the submission of a bid and being in doubt as to the meaning or intent of said Contract Documents should request of the City, in writing, an interpretation thereof. Any interpretation of said Contract Documents shall be made only in writing by the City.

4. **ESTIMATE OF QUANTITIES**

The estimate of quantities of work to be done as stated in the Bid Form, although stated with as much accuracy as possible, is approximate only and is assumed solely for the purpose of comparing bids. The quantities on which payments will be made to the Contractor are to be determined by measurement of the work actually performed and paid at the unit price bid, regardless of the amount of increase or decrease in the estimated quantities as specified in the Contract Documents. The City reserves the right to increase or diminish the amount of any class of work as may be deemed necessary.

5. **CONSTRUCTION CONTRACTORS’ BOARD - STATE LANDSCAPE CONTRACTORS’ BOARD**

All contractors bidding on public contracts must be licensed with the Construction Contractors’ Board or the State Landscape Contractors Board as required by ORS 701.021 or 671.530. Bids must be identified with the Contractors’ Board license number. No bids will be considered without this information.

6. **DISCLOSURE OF FIRST-TIER SUBCONTRACTORS**

When a public improvement contract value is greater than $100,000, all bidders are required to disclose information about first-tier subcontractors, providing labor or labor and materials, when the contract amount of such first-tier subcontractor is equal to or greater than:

1) 5% of the project bid, or $15,000, whichever is greater; or
2) $350,000 regardless of the percentage of the total bid.

Bidders must disclose the following information about such subcontracts, on the First-Tier Subcontractor Disclosure Form provided by the City and included herein, within two hours of the bid submission deadline:

1) The subcontractor’s name;
2) The subcontract dollar value; and
3) The category of work to be performed by the subcontractor.
Any bidder not using subcontractors subject to the above disclosure form, must write “NONE” on the Disclosure Form and sign and submit the form. The City will reject a bid if the bidder fails to submit the Disclosure Form before the deadline.

7. **DRUG TESTING PROGRAM**

ORS 279C.505(2) requires public improvement contracts to include a provision requiring contractors to demonstrate that they have an employee drug and alcohol testing program in place. All bidders are required to certify, on the Drug Testing Program Certification Form provided by the City and included herein, that they have such program in place. This certification will become part of the Contract if awarded and contractor will be required to maintain such program throughout the performance of the Contract. Failure to maintain a program shall constitute a material breach of the Contract.

8. **PROMPT PAY POLICY - TIMELY PROGRESS PAYMENTS**

ORS 279C.570 and 279C.580 require prompt payment to contractors and subcontractors and provides for settlement of compensation disputes between the parties. The City is required to automatically calculate and pay interest on invoices from the contractor when payments become overdue. The interest commences thirty (30) calendar days after receipt of the invoice from the contractor, or fifteen (15) calendar days after the payment is approved by the City, whichever is earlier. The rate of interest charged to the City on the amount due shall equal three times the discount rate on 90-day commercial paper, but shall not exceed 30 percent.

The City is also required to ensure that the contractor includes a clause in each subcontract that obligates the contractor to pay first-tier subcontractors for satisfactory performance under its contract. Contractors must pay subcontractors within ten (10) calendar days of receiving payment from the City. Contracts between primary contractors and subcontractors must also contain an interest penalty clause that obligates the contractor, if payment is not made to the subcontractor within thirty (30) calendar days after receipt of payment from the City, to pay the first-tier subcontractor an interest penalty on amounts due in the case of each payment not made in accordance with the subcontract payment clause. The contractor is also required to ensure that first-tier subcontractors include these requirements in each of its subcontracts with lower-tier subcontractors or suppliers.

If requested in writing by a first-tier subcontractor, within ten (10) calendar days after receiving the request, the contractor must provide the first-tier subcontractor, a copy of that portion of any invoice or request for payment submitted to the City, or pay document provided by the City to the contractor, specifically related to any labor or materials supplied by the first-tier subcontractor.

9. **PRE-QUALIFICATION OF BIDDERS**

When required, bidders shall pre-qualify under ORS 279C.430 and 279C.435, and shall submit the information requested on the form furnished by the City. This information shall be submitted at least ten (10) calendar days prior to the date of bid opening. Bidder qualifications are approved on a calendar year basis and must be renewed annually by
filing a new pre-qualification application and obtaining approval after January 1 of each year. The City will accept the approval of qualifications granted from the Department of Transportation and the Department of Administrative Services, including the time periods used by those agencies.

10. **BID BOND, PUBLIC WORKS BOND, PAYMENT BOND AND PERFORMANCE BOND**

A Bid Bond, Public Works Bond Filing Certification, Payment Bond and Performance Bond shall be provided as specified in Subsection 5.4 of the General Conditions. No waivers, special requirements or emergency provisions have been established for this Contract.

11. **HIGHEST STANDARDS OF WORK AND CONSEQUENCES FOR FAILURE**

The work to be performed must meet the highest standards prevalent in the industry or business most closely related to the work to be performed. Failure to meet such standards may result in consequences including, but not limited to a reduction or withholding of payment; a requirement that bidder perform, at bidder's own expense, additional work required to meet such standards; or termination of the contract, with damages being sought.

12. **CONDITIONS OF WORK**

Bidders must make their own determination of the nature of the work proposed under this Contract, the local conditions which can be encountered in this area, and all other matters which can in any way affect the work proposed under this Contract. It shall also be the bidder's responsibility to be thoroughly familiar with the Contract Documents. Failure to make the examination necessary for this determination or to examine any form, instrument or document of the Contract shall not release the bidder from the obligations of this Contract.

13. **REVIEW OF BIDS; BASIS FOR AWARD; NOTICE OF INTENT TO AWARD; AND RIGHT TO PROTEST AWARD**

In reviewing all bids received and determining the lowest responsible bidder, the City reserves the right to take into account and give reasonable weight to the extent of the bidder's experience on work of the nature involved, on the bidder's record as to dependability in carrying out of contracts, and evidence of present ability to perform the Contract in a satisfactory manner.

The City may make such investigations as deemed necessary to determine the ability of the bidder to perform the work, and the bidder shall furnish to the City all such information and data for this purpose as the City may request. The City reserves the right to reject any bid if the evidence submitted by, or investigation of, such bidder fails to satisfy the City that such bidder is properly qualified to carry out the obligations of the Contract, to complete the work contemplated therein, and to do so in a timely manner. The City specifically reserves the right to reject a bid from a bidder who, at the time bids are opened, has failed to complete work in a timely manner under a contract previously awarded to the bidder by the City. Conditional bids will not be accepted.
In accordance with ORS 279A.120(2)(b), in determining the lowest responsible bidder, the City shall, for the purpose of awarding the Contract, add a percentage increase on the bid of a non-resident bidder equal to the percent, if any, of the preference given to that bidder in the state in which the bidder resides.

Within forty-five (45) calendar days after the bid opening, the City will accept one of the bids or reject all of the bids received. If the City intends to accept one of the bids, it shall issue a Notice of Intent to Award the Contract to all bidders. The City’s award will not be final until seven (7) calendar days after the date of the notice if no protest is filed; or if a protest is filed, until the City provides a written response to all timely-filed protests that denies the protest and affirms the award.

A bidder may submit a formal written protest to the City’s Notice of Intent to Award the Contract within seven (7) calendar days of the date of the City’s Notice of Intent. The written protest must specify the grounds upon which the protest is based and must show that the protesting party is an adversely affected or aggrieved bidder. A bidder is adversely affected or aggrieved only if the bidder is eligible for award of the Contract as the responsible bidder submitting the lowest responsible bid, is next in line for award and claims that all lower bidders are ineligible for award in accordance with law.

Such protest must be submitted to the City Recorder, 900 SE Douglas, Roseburg, OR 97470. Any protest received after the 7-day deadline will not be considered. The City Recorder shall forward such protest to the City Manager who shall have the authority to settle or resolve the protest by written decision.

14. EXECUTION OF CONTRACT, BONDS AND DAMAGES FOR FAILURE TO EXECUTE

The bidder whose bid is accepted will be required to appear within ten (10) calendar days after notice that the Contract has been awarded to bidder and to execute the Contract with the City for the full and complete performance of all work specified, and as required by Subsection 5.4 of the General Conditions, deliver the Public Works Bond Filing Certification form, the Payment Bond to assure payment of the obligations incurred in the performance of the Contract and the Performance Bond and to ensure performance of the Contract.

Should the successful bidder fail or refuse to execute the Contract and furnish the Public Works Bond Filing Certification form, Payment Bond and/or Performance Bond when required, then the Bid Bond deposited by said bidder shall be retained by the City as liquidated damages.

15. COMMENCEMENT DATE AND EXPIRATION DATE OF CONTRACT

This Contract shall be in effect from the time the Contract is signed until the Project is completed. The Contractor must be capable of commencing construction on the work contemplated in the Contract Documents within ten (10) calendar days after the execution of the Contract and receipt of the City’s notification to proceed and shall complete the same within the time specified in the bid.
16. **DURATION OF BIDS; RETURN OF BID BONDS**

All bids will be binding until the later of:

1) the day the contract is executed; or
2) sixty (60) calendar days after the date of bid opening.

Bid bonds will be returned to unsuccessful bidders not later than the date on which the bids are no longer binding.

17. **PUBLIC RECORDS**

These Contract Documents and each bid received in response to it, together with copies of documents pertaining to the award of a contract shall be kept on file as a public record by the City Recorder; provided however, such records shall not be disclosed until after the notice of intent to award the contract has been issued.

18. **RECORDS REVIEW; CONFIDENTIALITY**

After notice of intent to award the resulting contract has been issued, all bids shall be available for public inspection except for those portions of a bid that the bidder designates in its bid as trade secrets or as confidential proprietary data in accordance with applicable state law. If the City determines such designation is not in accordance with applicable law, the City shall make those portions available for public inspection. The bidder shall separate information designated as confidential from other non-confidential information at the time of submitting its proposal. Prices, makes, models or catalog numbers of items offered, scheduled delivery dates and terms of payment are not confidential, and shall be publicly available regardless of a bidder’s designation to the contrary.

19. **MATERIALS CONTAINING ASBESTOS**

Materials containing asbestos may be present in underground pipe systems. All appropriate Federal, State, County and Municipal rules, regulations and guidelines must be followed when working with asbestos containing material. Non friable material must be handled, transported and disposed of in a way that prevents it from becoming friable and releasing asbestos fibers. If AC pipe is shattered, damaged or badly weathered, it is considered to be friable and will likely release asbestos fibers. A DEQ licensed asbestos abatement contractor using DEQ certified workers must remove all friable asbestos material. Any and all permits and fees that are required by the DEQ, Douglas County and any other regulatory agency must be obtained and paid for by the Contractor prior to disposing of the asbestos containing material. For information about asbestos rules, contact the DEQ Western Region office in Medford, Oregon.
BIDDER’S CHECK LIST

Bidder’s attention is called to the following forms, which must be executed in full as required with the bid:

A. **BID FORM(S):** Each bidder shall complete the bid form(s). Prices must be shown in the spaces provided and must be expressed in figures.

B. **BID BOND:** This form is to be executed by bidder and bidder’s Surety. The amount of cash, certified check, cashier’s check, irrevocable letter of credit or Bid Bond shall not be less than 10% of the total Bid amount.

C. **FIRST-TIER SUBCONTRACTOR DISCLOSURE FORM:** When required by law, this form must be submitted by the bid submission deadline, at which time bids will be opened and read, or within two (2) working hours of such submission deadline. If no subcontractors for labor or for labor and materials will be used, the bidder must write “NONE” on the disclosure form, sign and submit the form as required. Failure to submit this form within two hours of the bid submission deadline will result in the bid becoming non-responsive and such bid will be returned to the bidder.

D. **DRUG TESTING PROGRAM CERTIFICATION FORM:** This form must be submitted with the bid to demonstrate that bidder has an employee drug and alcohol testing program in place and will continue to keep the program in place throughout the duration of performing the Contract awarded.

E. **PUBLIC WORKS BOND PRE-BID NOTICE & CERTIFICATION FORM:** This form must be submitted with the bid to demonstrate contractor’s awareness of and intended compliance with the requirement to file a Public Works Bond with the Construction Contractors Board prior to beginning work on the project if awarded the bid.

The following forms are to be executed after the Contract is awarded, prior to beginning work on the project:

A. **CONSTRUCTION CONTRACT:** This agreement is to be executed by the successful bidder.

B. **PERFORMANCE BOND AND PAYMENT BOND:** Both a Performance Bond and a Payment Bond are to be executed by the successful bidder and bidder’s Surety Company and submitted at the time the Contract is executed.

C. **PUBLIC WORKS WAGE CERTIFICATION FORM:** This form is to be completed in accordance with state law and submitted with the first and last request for payment.

D. **CERTIFICATE OF INSURANCE:** This certificate is to be executed by the successful bidder and bidder’s insurance company and submitted at the time the Contract is executed.

E. **PUBLIC WORKS BOND FILING CERTIFICATION:** This form is to be executed by the successful bidder and submitted at the time the Contract is executed to certify if Contractor has filed the required Public Works Bond or elected not to file the Bond due to qualifying under ORS 200.055.
BID FORM

City of Roseburg
900 SE Douglas Avenue
Roseburg, Oregon 97470

The undersigned bidder has carefully examined the Contract Documents for the construction of the

Chlorination System Improvements
19WA03

referred to in the Invitation to Bid dated August 28, 2019, inviting bids on such Project and also the site of the Project. Bidder will provide all necessary labor, equipment, tools, apparatus and other means of construction, do all the work and furnish all the materials called for by said Contract Documents in the manner prescribed therein to provide a complete Project.

The undersigned bidder understands that the quantities of work as shown herein are approximate only, unless noted otherwise, and are subject to increase or decrease. The bidder offers to perform the work, at the unit price stated in the following schedule, whether the quantities are increased or decreased.

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Description</th>
<th>Unit*</th>
<th>Estimated Quantity</th>
<th>Unit Price (in figures)</th>
<th>Estimated Total Price (in figures)</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>Mobilization, demobilization, site-preparation, and clean-up</td>
<td>LS</td>
<td>1</td>
<td>$</td>
<td>$</td>
</tr>
<tr>
<td>2</td>
<td>Bulk sodium hypochlorite chlorination system</td>
<td>LS</td>
<td>1</td>
<td>$</td>
<td>$</td>
</tr>
<tr>
<td>3</td>
<td>Chlorination carrier water replacement</td>
<td>LS</td>
<td>1</td>
<td>$</td>
<td>$</td>
</tr>
<tr>
<td>4</td>
<td>Electrical</td>
<td>LS</td>
<td>1</td>
<td>$</td>
<td>$</td>
</tr>
<tr>
<td>5</td>
<td>Telemetry and automatic control</td>
<td>LS</td>
<td>1</td>
<td>$</td>
<td>$</td>
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<tr>
<td>6</td>
<td>Construction records and O&amp;M manuals</td>
<td>LS</td>
<td>1</td>
<td>$3,000</td>
<td>$3,000</td>
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<td>7</td>
<td>Testing, startup and training</td>
<td>LS</td>
<td>1</td>
<td>$7,000</td>
<td>$7,000</td>
</tr>
</tbody>
</table>

Schedule A Bid Item Total: $7,000

*Abbreviations:

LS – Lump Sum        CY – Cubic Yard       EA – Each
LBS – Pounds          LF – Lineal Feet      IN – Inches
SY – Square Yard      TONS – Tons

The undersigned also declares and agrees as follows:
1. That the only persons or parties interested in this bid are those named herein, that the bid is in all respects fair and without fraud, and that it is made without any connection or collusion with any person making another bid on this Contract.

2. That the bidder, and any subcontractor upon which the bidder is relying, have carefully examined and had an opportunity to comment on, the Contract Documents for the construction of the proposed improvements including a full set of the plans and specifications, including all addenda thereto; that bidder has personally inspected the contemplated construction area or areas; that bidder is satisfied as to the adequacy and completeness of the plans and specifications, the feasibility of the work described therein, quantities of materials, items of equipment and conditions of work involved, including the fact that the description of work and materials as included herein are approximate only; and that this bid is made according to the provisions and under the terms of the Specifications which are hereto attached and hereby made a part of this bid.

3. All of the Specifications and Plans which are listed herein have been examined by the undersigned bidder and the terms and conditions thereof are hereby accepted.

4. It is understood that the Plans may be supplemented by additional Drawings and Specifications in explanation and elaboration of the Plans and it is agreed that such Supplemental Drawings, when not in conflict with those referred to in Paragraph 3 above, will have the same force and effect as if completed and attached hereto, and that when received, will be considered a part of the Contract Documents.

5. It is understood that all work will be performed under the price schedule outlined herein and that all services, materials, labor and equipment and all work necessary to complete the Project in accordance with the Plans and Specifications shall be furnished for the prices named in the bid. If there is a change in the scope of work or work which cannot be properly classified under the price schedule then bidder agrees to do this work as "extra work". The undersigned bidder agrees to do any extra work and furnish materials, and to accept as full compensation therefore at such prices as may be agreed upon in writing by the City and the Contractor before extra work begins. Each party binds itself to agree to reasonable prices.

6. It is understood the work to be performed must meet the highest standards prevalent in the industry or business most closely related to the work to be performed. It is further understood that failure to meet such standards may result in consequences including, but not limited to, a reduction or withholding of payment; a requirement that bidder perform, at bidder's own expense, additional work required to meet such standards; or termination of the contract, with damages being sought.

7. The bidder agrees that if this bid is accepted, the bidder will, within ten (10) calendar days after the notification of acceptance, execute the Construction Contract with the City in the form of Contract specified, and will, at the time of execution of the Contract, deliver to the City the Performance Bond, Payment Bond and Public Works Bond Filing Certification form as required herein, and will furnish all the materials necessary to
complete the Project in the manner, in the time and according to methods as specified in the Specifications and required by the City.

8. The cash, certified check, cashier’s check, irrevocable letter of credit or Bid Bond shall be payable to the City to the extent of 10% of the amount of the bid in case this bid is accepted by the City and the undersigned shall fail or refuse to execute the Contract and furnish a Payment Bond, a Performance Bond or the Public Works Bond Filing Certification form as required by the Specifications within the time limit named therein after notification that said bid is accepted, all in accordance with the provisions of this bid and the Plans and Specifications which are a part hereof.

9. All items for the Contract for which forms are provided herein have been completed in full by the showing of prices for each and every item thereof, and for the showing of other information indicated by the Bid Form.

10. Bidder agrees to begin work within ten (10) calendar days after the execution of the Contract proposed herein and receipt of the City’s notification to begin work and to complete work in all respects within two hundred forty (240) calendar days after "Notice to Proceed" has been issued by the City.

11. In the event the bidder is awarded the Contract and fails to complete the Project within the time limit or extended time agreed upon, as more specifically set forth in the General Conditions, liquidated damages shall be paid to or withheld by the City pursuant to Paragraph 4 of the Construction Contract (Time of Performance - Liquidated Damages) at the rate of Five Hundred Dollars ($500) per day, until the Project has been completed as provided in the General Conditions.

12. The undersigned bidder hereby states, as part of this bid, that the applicable provisions of Oregon’s Prevailing Wage Law (ORS 279C.800 to 279C.870) and the Federal Prevailing Wage Law (Davis-Bacon Act, 40 U.S.C. 3141-3148), shall be complied with. When the Project is subject to both the State and Federal Prevailing Wage Laws and rates, workers in each trade will be paid the higher of the two rates.

13. The undersigned bidder and bidder's subcontractors shall comply with ORS 656.017, which requires them to provide Workers' Compensation coverage for all their subject workers.

14. The undersigned bidder hereby states, as part of this bid, that bidder shall comply with ORS 279C.505(2) which requires bidder to have an employee drug testing program in place.

15. The undersigned bidder and bidders' subcontractors shall comply with ORS 279C.570 and 279C.580, which require timely progress payments for public improvement projects and provide interest penalties for late payment.

16. The undersigned bidder hereby states, as part of this bid, bidder and bidder’s subcontractors shall comply with the provisions of Exhibit "A" - "Standard City Contract Provisions".
17. If the bidder is awarded the Contract for this work, the name and address of the Surety who will provide the Payment Bond, Performance Bond and Public Works Bond (if required) will be:______________________________________________________________.

18. The name and address of the bidder who is submitting this bid is:__________________________________________________________, which is the address to which all communications pertinent to this bid and the Contract shall be sent. The bidder’s email address is:__________________________________________________________.

19. The names of the principal officers of the corporation submitting this bid or of the partnership, or of all parties interested in this bid as principals are as follows:_________________________________________________________.

20. The undersigned bidder acknowledges that Addenda No. _____ through ______ have been delivered to bidder and have been examined as part of the Contract Documents.

21. In the prosecution of this work, the bidder proposes to use the subcontractors listed on the First-Tier Subcontractor Disclosure Form presented within two working hours of the bid submission deadline as set forth in the Invitation to Bid. Any bidder not using subcontractors subject to the above referenced Disclosure Form shall indicate “NONE” on the Disclosure Form and sign and submit the form as required.

22. Declaration of Residency: I "am" or "am not" (circle one) a "resident bidder"* as defined by ORS 279A.120, a contractor that has paid unemployment taxes or income taxes in Oregon during the 12 calendar months immediately preceding submission of the bid, has a business address in this state and has stated in the bid whether the bidder is a "resident bidder" pursuant to ORS 279A.120.

23. The bidder’s Construction Contractors Board License Number or Landscape Contractors Board License Number is: ________________.

24. Bidder’s Tax Identification Number: ________________ Email: ________________.

25. Public Works Bond: If the bid is accepted, prior to beginning work on the project, the bidder will file with the Construction Contractors Board, a Public Works Bond in the amount of $30,000 with a corporate surety authorized to do business in the State of Oregon; and before permitting a subcontractor to begin work on the project, the bidder will verify that the subcontractor has also filed the aforementioned bond. If the bidder, as a certified disadvantaged, minority, women or emerging small business enterprise, elects not to file the Public Works Bond, bidder will file written verification of such certification with the Construction Contractors Board and provide the Board and the City of Roseburg with notice of such election.

If sole Proprietor or Partnership:
In witness hereto, the undersigned as set his/her hand this __________ day of __________________, 2019.

Printed name of bidder:__________________________
Signature of bidder:______________________________
If Corporation:
In witness whereof, the undersigned corporation has caused this instrument to be executed and its seal affixed by its duly authorized officers this ____ day of ________________, 2019.

Name of Corporation:__________________________________________________________

Printed name of person signing:________________________________________________

Signature:______________________________________________________________

Title:_______________________________________________________________

Attest: ____________________________________________________________

Secretary
STANDARD BID BOND

We, _________________________________________, “as Principal,”
(Name of Principal)
and _________________________________________, an _________________ Corporation,
(Name of Surety)

authorized to transact Surety business in Oregon, as “Surety,” hereby jointly and severally bind
ourselves, our respective heirs, executors, administrators, successors and assigns to pay unto
the City of Roseburg (“Obligee”) the sum of ($__________________________________)________
dollars.

WHEREAS, the condition of the obligation of this bond is that Principal has submitted its proposal
or bid to an agency of the Obligee in response to Obligee’s procurement document (No. ________________)
for the project identified as: _______________________________________________________________,
which proposal or bid is made a part of this bond by reference, and Principal is required to furnish bid security in an
amount equal to ten percent (10%) of the total amount of the bid pursuant to the procurement
document and ORS 279C.365(5) for competitive bidding or 279C.400(5) for competitive
proposals.

NOW, THEREFORE, if the proposal or bid submitted by Principal is accepted, and if a contract
pursuant to the proposal or bid is awarded to Principal, and if Principal enters into and executes
such contract within the time specified in the procurement document and executes and delivers
to Obligee its good and sufficient performance bond, payment bond and public works bond as
required by Obligee within the time fixed by Obligee, then this obligation shall be void; otherwise,
it shall remain in full force and effect.

IN WITNESS WHEREOF, we have caused this instrument to be executed and sealed by our duly
authorized legal representatives this _____ day of ___________________, 2019.

PRINCIPAL: ___________________________ SURETY: ___________________________

By ___________________________ BY ATTORNEY-IN-FACT:
   Signature

_______________________________ Official Capacity ______________________________
   Name

Attest: ___________________________ Corporation Secretary ___________________________
   Signature

_______________________________ Address ______________________________
   City __________________________ State ______ Zip __________________________

   Phone __________________________ Email __________________________
FIRST TIER SUBCONTRACTOR DISCLOSURE FORM INSTRUCTIONS

Instructions for First-Tier Subcontractor Disclosure:

Bidders are required to disclose information regarding certain first-tier subcontracts (ORS 279C.370). Specifically, when the contract amount of a first-tier subcontract furnishing labor or labor and materials would be great than or equal to: (1) 5% of the project bid, but at least $15,000; or (2) $350,000 regardless of the percentage, the bidder must disclose the following information about that subcontract either in its bids submission, or within two hours after bid closing:

(A) The subcontractor’s name;

(B) The category of work that the subcontractor would be performing; and

(C) The dollar value of the subcontract.

If the bidder will not be using any subcontractors that are subject to the above disclosure requirements, the bidder is required to indicate “NONE” on the accompanying form.

THE CONTRACTING AGENCY MUST REJECT A BID IF THE BIDDER FAILS TO SUBMIT THE DISCLOSURE FORM WITH THIS INFORMATION BY THE STATED DEADLINE (OAR 137-049-0360).

* The subject form is on the following page.
FIRST TIER SUBCONTRACTOR DISCLOSURE FORM

PROJECT NAME: ________________________________

BID#: ________________________________

BID CLOSING: DATE: _______________ TIME: _______________

This form must be submitted at the location specified in the Invitation to Bid on the advertised bid closing date and within two working hours after the advertised bid closing time.

List below: the name of each subcontractor that will be furnishing labor or labor and materials and is required to be disclosed, the category of work that the subcontractor will be performing and the dollar value of the subcontract. Enter “NONE” if there are no subcontractors that need to be disclosed. (ATTACH ADDITIONAL SHEETS IF NEEDED)

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Failure to submit this form by the disclosure deadline will result in a nonresponsive bid. A nonresponsive bid will not be considered for award.

Form submitted by (bidder name): ________________________________

Contact name: ________________________________ Phone #: ________________________________

Form Received in the City Recorder’s Office:

Time: __________ Date: __________ By: ________________

**********************************************************************************************************
EMPLOYEE DRUG TESTING PROGRAM
CERTIFICATION FORM

BIDDER’S NAME:__________________________________________

PROJECT NAME & NUMBER:________________________________

ORS 279C.505 (2) provides that every public improvement contract contain a condition that the Contractor shall demonstrate that an employee drug testing program is in place. The City’s award of the Contract for which this certificate is required is conditioned, in part, upon the Bidder’s demonstration of compliance with the provisions of ORS 279C.505(2). If the Bidder named above is awarded the Contract, this certificate shall become a part of, and shall constitute a continuing representation and warranty under, the Contract.

To induce the City to award the Contract to the Bidder, the undersigned, as the duly authorized representative of the Bidder, hereby represents and warrants, on behalf of the above named Bidder:

1. That Bidder has and enforces, and at all times during the term of the Contract will have and enforce, a written employee drug testing policy that at a minimum, requires compliance with the Oregon Department of Transportation Commercial Drivers License drug testing regulations;

2. A copy of the Bidder’s current written employee drug testing policy will be available for inspection by the City at any time upon the City’s request; and

3. The Bidder understands and agrees that its representations and warranties herein will become a continuing part of the Contract and that breach of any of the foregoing will be sufficient grounds for disqualification under 279C.440(2)(d).

The City shall not be liable, either directly or indirectly, in any dispute arising out of the substance or procedure of Bidder/Contractor’s drug testing program. Nothing in this drug testing provision shall be construed as requiring Bidder/Contractor to violate any legal, including constitutional rights of any employee, including but not limited to, selection of which employees to test and the manner of such testing. The City shall not be liable for Bidder/Contractor’s negligence in establishing or implementing, or failure to establish or implement, a drug testing policy, or for any damage or injury caused by Bidder/Contractor’s employees acting under the influence of drugs while performing work covered by the Contract. These are Bidder/Contractor’s sole responsibilities.

In Witness whereof, the Bidder has caused this document to be executed by its duly authorized representative on the date shown below.

Signature:_______________________________________________

Printed Name, Title:________________________________________

Date:____________________________________________________
CITY OF ROSEBURG
PUBLIC WORKS BOND - PRE-BID NOTICE AND CERTIFICATION

I, the undersigned contractor, hereby certify that if awarded the contract for which I am submitting this bid, prior to beginning work on such Project, unless exempt under ORS 279C.800 to 279C.870, I will file with the Construction Contractors Board, a Public Works Bond in the amount of $30,000 with a corporate surety authorized to do business in the State of Oregon. I further certify that before permitting a subcontractor to start work on the Project upon which I am submitting this bid, I will verify that the subcontractor has also filed such Public Works Bond or has elected not to file such bond as allowed by state law. The Public Works Bond shall provide that the contractor or subcontractor will pay claims ordered by the Bureau of Labor and Industries to workers performing labor upon public works projects. The bond shall be a continuing obligation and remain continuously in effect.

If, as a contractor, I qualify as a disadvantaged, minority, women, disable veteran or emerging small business enterprise certified under ORS 200.055 and I have elected not to file the aforementioned Public Works Bond, I hereby certify that I will file written verification of such certification with the Construction Contractors Board. I also certify that before beginning any work on the Project, I will provide the City of Roseburg and the Construction Contractors Board written notice that I have elected not to file the Public Works Bond. If so certified under ORS 200.055, I understand that my election not to file the Public Works Bond will expire one year from the date it was filed and that a claim for unpaid wages may be filed against the payment bond I submitted on the Project.

I further certify that I understand the Public Works Bond described above is in addition to any other bond that I am required to provide, or that may be required of a subcontractor, for this Project.

Project Name: _______________________________________________

Project Number: _____________________________________________

Contractor’s Printed Name: ____________________________________

Contractor’s Signature: _______________________________________

Dated: ___________________
CONSTRUCTION CONTRACT

This Contract is made and entered into this ______ day of ________________, 2019, by and between ______________________ hereinafter called the "Contractor", and the City of Roseburg, a municipal corporation of the State of Oregon, hereinafter called the "City".

WITNESSETH

That the Contractor and City, for the consideration hereinafter described agree as follows:

1. WORK TO BE PERFORMED. The Contractor agrees to do all the work and furnish all necessary labor, materials, tools and equipment for the completion of the Chlorination System Improvements, Project No. 19W03 in accordance with the bid made by the Contractor on the ____ day of _____________, 2019, all in full compliance with the Contract Documents referred to herein, and guarantees all materials and workmanship for one year after acceptance of the project.

2. CONTRACT DOCUMENTS. The Contract Documents include the City's Invitation to Bid, Information to Bidders, the Bid Form signed by the Contractor, this Construction Contract with Exhibit A, First-Tier Subcontractor Disclosure Form, Drug Testing Program Certification Form, Bidder’s Responsibility Form, Performance Bond, Payment Bond, Public Works Bond Filing Certification form (when required), General Conditions, Technical Provisions, Special Conditions, Standard Drawings, Specifications and Plans and Supplemental Specifications, all as required for the full execution and satisfactory completion of the work. All of the Contract Documents are incorporated herein by this reference and made a part of this Contract.

3. PAYMENT. In consideration of the faithful performance of the work herein described, the City agrees to pay the Contractor ________________ as payment in full per the provisions of the Contract Documents.

4. TIME OF PERFORMANCE - LIQUIDATED DAMAGES. The Contractor shall commence work under this Contract upon receiving notification to proceed from the City. The Contractor agrees that the work under this Contract shall be completed within two hundred forty (240) calendar days after notification to begin work. If the Contractor fails to complete the Project within the time hereinbefore mentioned, or in the extended time agreed upon, liquidated damages shall be paid to or withheld by the City at the rate of Five Hundred Dollars ($500) per day until the Project is completed. It has been agreed that the damages arising from a delay in completion would be difficult to ascertain with any degree of accuracy, even after the Project is completed. It has also been agreed that the amount of liquidated damages specified herein is a reasonable forecast of just compensation for the harm that will be caused by a delay in completion of the Project. Any such sum which the Contractor may be obligated to pay under the terms of this Paragraph is paid as liquidated damages, and not as a penalty.

5. COMPLIANCE WITH LAW. The Contractor shall comply with all local, state and federal laws, ordinances and regulations applicable to contracts covering municipal contracts, and shall make prompt payment of all amounts that may be due from said Contractor in the way of taxes, other governmental charges or lawful deductions, and shall make prompt payment of all labor and materials and shall save the City harmless from any damages or claims whatsoever in the performance of the Contract. Contractor and all subcontractors agree to comply with the

6. **NOTICE.** Any notice required or permitted by this Contract must be delivered and served personally, or alternatively, deposited in the United States mail, postage prepaid, registered or certified, return receipt requested, addressed to the parties as shown below:

   **CITY:**
   City of Roseburg  
   ATTN: City Manager  
   900 SE Douglas Avenue  
   Roseburg OR 97470

   **CONTRACTOR:**

Such notice, if mailed within the State of Oregon, shall be deemed delivered upon the second day following the date postmarked. If mailed outside the State of Oregon, notice shall be deemed delivered upon the fifth day following the date postmarked.

7. **GOVERNING LAW; VENUE LOCATION.** Oregon law shall be applied to all actions relating to the Contract, and the venue in any such action shall lie in the Circuit Court of Douglas County, Oregon.

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

**CITY**  
____________________________
Nikki Messenger  
City Manager Pro-Tem

**CONTRACTOR**  
____________________________
(Authorized Signature)

Title:______________________________

Date:______________________________

Date:______________________________

**ATTEST:**  
____________________________
Amy L. Sowa, City Recorder

**Tax Identification Number**

Email:______________________________

Revised 3/2019
EXHIBIT “A”
STANDARD CONTRACT PROVISIONS
PREVAILING WAGE CONTRACT
(ORS 279C.800 - 279C.870)

The following provisions, if applicable, are hereby included in and made a part of the attached public contract which is subject to Prevailing Wage Laws and rates, between the City of Roseburg and the Contractor named therein as provided for in the Roseburg Code, Oregon Revised Statutes, and Federal laws, rules, regulations, and guidelines. If a Contractor or Subcontractor violates the provisions below, the City may, at its option, terminate the contract or a subcontract and said Contractor or Subcontractor in such event shall forfeit all rights under the contract except to payment for actual labor and materials furnished to the City. The City may waive in whole or in part any forfeitures or sanctions provided in this Exhibit.

1. PREFERENCE FOR OREGON GOODS AND SERVICES; NONRESIDENT CONTRACTOR REPORT TO DEPARTMENT OF REVENUE - ORS 279A.120:

1.1 For purposes of awarding the contract the City will:

1.1.1 give preference to goods and services that have been manufactured or produced in Oregon if the price, fitness, availability and quality are otherwise equal; and

1.1.2 add a percentage increase to the bid of a non-resident bidder equal to the percentage, if any, of the preference given to the contractor in the same state in which the contractor lives.

1.2 As used in this Section:

1.2.1 “nonresident contractor” means a contractor that is not a resident contractor;

1.2.2 “resident contractor” means a contractor that has paid unemployment taxes or income taxes in the state of Oregon during the twelve (12) calendar months immediately preceding submission of the bid for the contract; has a business address in this state; and stated in the bid for the contract that it was not a “resident bidder” under ORS 279A.120.

1.3 If the Contractor is a nonresident contractor and the contract price exceeds $10,000, the Contractor shall promptly report to the Department of Revenue on forms to be provided by the Department, the total contract price, terms of payment, length of contract and such other information as the Department may require before the Contractor may receive final payment on the public contract. The City shall satisfy itself that the requirement of this Subsection has been complied with before it issues a final payment on the contract.

2. PAYMENT OF LABORERS AND MATERIALMEN, CONTRIBUTIONS TO INDUSTRIAL ACCIDENT FUND, LIENS, AND WITHHOLDING TAXES - ORS 279C.505(1):

The Contractor shall:
2.1 Make payment promptly, as due, to all persons supplying to such Contractor, labor or material for the performance of the work provided for in the contract.

2.2 Pay all contributions or amounts due the Industrial Accident Fund from such Contractor or Subcontractor incurred in the performance of the contract.

2.3 Not permit any lien or claim to be filed or prosecuted against the City of Roseburg or any subdivision or agency or employee thereof on account of any labor or material furnished.

2.4 Pay to the Department of Revenue all sums withheld from employees pursuant to ORS 316.167.

3. **PAYMENT OF CLAIMS BY PUBLIC OFFICERS - ORS 279C.515:**

3.1 If the Contractor fails, neglects or refuses to make prompt payment of any claim for labor or services furnished to the Contractor or a Subcontractor by any person in connection with the contract as such claim becomes due, the public officer or officers representing the City of Roseburg may pay such claims to the person furnishing the labor or services and charge the amount of the payment against funds due or to become due the Contractor by reason of the contract. The payment of a claim in the manner authorized shall not relieve the Contractor or his/her surety from his or her obligations with respect to any unpaid claims.

3.2 If the Contractor or a first-tier Subcontractor fails, neglects or refuses to make payment to a person furnishing labor or materials in connection with the contract within thirty (30) days after receipt of payment from the City of Roseburg or the Contractor, the Contractor or first-tier Subcontractor shall owe the person the amount due plus interest charges commencing at the end of the 10-day period that payment is due under ORS 279C.580(4) and ending upon final payment, unless payment is subject to a good faith dispute as defined in ORS 279C.580. The rate of interest charged to the Contractor or first-tier Subcontractor on the amount due shall equal three times the discount rate on 90-day commercial paper in effect at the Federal Reserve Bank in the Federal Reserve District that includes Oregon on the date that is thirty (30) calendar days after the date when payment was received from the City of Roseburg or from the Contractor, but the rate of interest shall not exceed 30 percent. The amount of interest may not be waived.

3.3 If the Contractor or Subcontractor fails, neglects or refuses to make payment to a person furnishing labor or materials in connection with the contract, the person may file a complaint with the Construction Contractors Board, unless payment is subject to a good faith dispute as defined in ORS 279C.580. The Contractor shall announce the foregoing in any Subcontract issued.

4. **HOURS OF LABOR - ORS 279C.520:** No person shall be employed for more than 10 hours in any one day, or 40 hours in any one week, except in cases of necessity, emergency, or when the public policy absolutely requires it, and in such cases the employee shall be paid at time and a half pay:
4.1 For all overtime worked in excess of 8 hours a day or 40 hours in any one week, when the work week is five consecutive days, Monday through Friday; or

4.2 For all overtime in excess of 10 hours a day or 40 hours in any one week when the work week is four consecutive days, Monday through Friday; and

4.3 For all work performed on Saturday and on any legal holiday specified in ORS 279C.540, or all holidays specified in a collective bargaining agreement.

The Contractor must give notice to employees who perform work on the contract, in writing, either at the time of hire or before commencement of work on the contract, or by posting a notice in a location frequented by employees, the number of hours per day and days per week that the employees may be required to work.

5. **PAYMENT FOR MEDICAL CARE AND ATTENTION TO EMPLOYEES - ORS 279C.530**:

5.1 The Contractor shall promptly as due, make payment to any person, co-partnership or association or corporation furnishing medical, surgical, and hospital care or other needed care and attention, incident to sickness or injury, to the employees of such Contractor, of all sums which the Contractor agrees to pay for such services and all monies and sums which the Contractor collected or deducted from the wages of employees pursuant to any law, contract or agreement for the purpose of providing or paying for such service.

5.2 The Contractor, its subcontractors, if any, and all employers providing work, labor or materials under this Contract who are subject employers under the Oregon Workers’ Compensation Law shall comply with ORS 656.017, which requires them to provide workers’ compensation coverage that satisfies Oregon law for all their subject workers. Out-of-state employers must provide workers’ compensation coverage that complies with ORS 656.126 for their workers. Employer’s Liability Insurance with coverage of not less than $500,000 each accident shall be included.

6. **PAYMENT TO SUBCONTRACTORS - ORS 279C.580**:

6.1 The Contractor shall include in each subcontract for property or services entered into by the Contractor and a first-tier Subcontractor, including a material supplier, for the purpose of performing the public contract:

6.1.1 A payment clause that obligates the Contractor to pay the first-tier Subcontractor for satisfactory performance under its subcontract within ten (10) calendar days of payment by the City out of such amounts as are paid to the Contractor by the City of Roseburg under the contract; and

6.1.2 An interest penalty clause that obligates the Contractor, if payment is not made within thirty (30) calendar days after receipt of payment from the City of Roseburg, to pay to the first-tier Subcontractor an interest penalty on amounts due in the case of each payment not made in accordance with the payment clause included in the subcontract pursuant to Paragraph 6.1.1 of this Subsection. A Contractor or first-tier Subcontractor
shall not be obligated to pay an interest penalty if the only reason that the Contractor or first-tier Subcontractor did not make payment when payment was due is that the Contractor or first-tier Subcontractor did not receive payment from the City of Roseburg or Contractor when payment was due. The interest penalty shall be:

6.1.2.1 For the period beginning on the day after the required payment date and ending on the date on which payment of the amount due is made; and

6.1.2.2 Computed at the rate specified in ORS 279C.515(2).

6.2 The Contractor shall include in each of its subcontracts, for the purpose of performance of such contract condition, a provision requiring the first-tier Subcontractor to include a payment clause and an interest penalty clause conforming to the standards set forth in Paragraphs 6.1.1 and 6.1.2 and requiring each of its Subcontractors to include such clauses in their subcontracts with each lower-tier Subcontractor or supplier.

6.3 None of the provisions of this Section 6 are intended to prevent the Contractor or any Subcontractor from including in its contracts the provisions described in ORS 279C.580(5) and (6).

7. **DRUG TESTING - ORS 279C.505(2):**

7.1 The Contractor shall demonstrate that an employee drug testing program is in place at the time of submitting its bid, and that such program will be maintained throughout the contract period, including any extensions. The failure of Contractor to have, or to maintain such a drug testing program is grounds for rejection of a bid or immediate termination of the contract.

7.2 The City of Roseburg shall not be liable, either directly or indirectly, in any dispute arising out of the substance or procedure of Contractor’s drug testing program. Nothing in this drug testing provision shall be construed as requiring Contractor to violate any legal, including constitutional, rights or any employee, including but not limited to, selection of which employees to test and the manner of such testing. The City shall not be liable for Contractor’s negligence in establishing or implementing, failure to establish or implement a drug testing policy, or for any damage or injury caused by Contractor’s employees acting under the influence of drugs while performing work covered by the contract. These are Contractor’s sole responsibilities and nothing in this provision is intended to create any third party beneficiary rights against the City.

8. **PREVAILING WAGE PROVISIONS - ORS 279C.800 - 279C.870; 40 U.S.C. 3141 – 3148:**

8.1 The hourly rate of wage to be paid by the Contractor and all Subcontractors to workers under the contract shall not be less than the prevailing rate of wage for an hour’s work in the same trade or occupation in the locality where the labor is performed as set forth in the specifications for the public contract; provided however, if the public contract is also subject to the Federal Prevailing Wage Rate pursuant to the Davis-Bacon Act (40 U.S.C. 3141 - 3148), then the higher of the two rates shall be paid. The Contractor will
comply with the provisions of ORS 279C.840 and all applicable provisions of ORS 279C.800 to 279C.870 and/or the Davis-Bacon Act, 40 U.S.C. 3141 - 3148.

8.2 The Contractor or the Contractor’s surety and every Subcontractor or the Subcontractor’s surety shall file certified statements with the City in writing using the form prescribed by the Commissioner of the Bureau of Labor and Industries certifying the hourly rate of wage paid each worker whom the Contractor or the Subcontractor has employed in the Work under the contract and further certifying that no worker employed under such public contract has been paid less than the prevailing rate of wage or less than the minimum hourly rate of wage specified in the contract. The certified statement shall be verified by the oath of the Contractor or the Contractor’s surety or Subcontractor or the Subcontractor’s surety that the Contractor or Subcontractor has read the certified statement and knows the contents thereof and that the same is true to the Contractor’s or Subcontractor’s knowledge. The certified statements shall set out accurately and completely the payroll records for the prior week including the name and address of each worker, the worker’s correct classification, rate of pay, daily and weekly number of hours worked, deductions made, and actual wages paid.

8.3 Each certified statement shall be delivered or mailed by the Contractor or Subcontractor to the City. A true copy of the certified statement shall also be filed at the same time with the Commissioner of the Bureau of Labor and Industries. Certified statements for each week during which the Contractor or Subcontractor employs a worker under the public contract shall be submitted once a month, by the fifth business day of the following month. Information submitted on certified statements may be used only to ensure compliance with the provisions of ORS 279C.800 to 279C.870. The City shall retain 25% of the amount earned by the Contractor if the certified statements are not submitted as required. The City shall pay the Contractor the amount retained within 14 days after the Contractor files the certified statements regardless of whether a Subcontractor has failed to file the required certified statements. The Contractor shall retain 25% of any amount earned by a first-tier Subcontractor until the Subcontractor has filed with the City, the required certified statements. The Contractor shall verify the first-tier Subcontractor has filed the certified statements before the Contractor may pay the Subcontractor any amount retained. The Contractor shall pay the first-tier Subcontractor the amount retained within 14 days after the Subcontractor files the required certified statements.

9. PUBLIC WORKS BOND REQUIREMENTS – ORS 279C.836:

9.1 If the public contract involves public works, unless exempt under ORS 279C.800 to 279C.870, prior to beginning work on the contract, the Contractor shall file with the Construction Contractors Board, a Public Works Bond in the amount of $30,000 with a corporate surety authorized to do business in the State of Oregon.

9.2 Before allowing a Subcontractor to begin work under a public contract involving public works, for which the Contractor has been awarded the contract, the Contractor shall verify that the Subcontractor has also filed a Public Works Bond with the Construction Contractors Board or elected not to file such bond as allowed by state law.
9.3 The Public Works Bond shall provide that the Contractor or Subcontract will pay claims ordered by the Bureau of Labor and Industries to workers performing labor under the public contract involving public works. The bond shall be a continuing obligation and remain continuously in effect.

9.4 If the Contractor or Subcontractor qualifies as a disadvantaged, minority, women, disabled veteran or emerging small business enterprise certified under ORS 200.055 and has elected not to file the Public Works Bond, the Contractor or Subcontractor will file written verification of such certification with the Construction Contractors Board. If the Contractor or Subcontractor elects not to file the Public Works Bond, before beginning any work on the public contract involving public works, the Contractor or Subcontractor shall provide the City and the Construction Contractors Board with written notification of such election.

10. DEMOLITION CONTRACTS; LAND AND LANDSCAPE MAINTENANCE - ORS 279C.510:

10.1 If the public contract includes demolition, the Contractor shall salvage or recycle construction and demolition debris, if feasible and cost effective.

10.2 If the public contract includes services for lawn and landscape maintenance, the Contractor shall compost or mulch yard waste material at an approved site.

11. DISCRIMINATION IN SUBCONTRACTING PROHIBITED; REMEDIES - ORS 279A.110:

11.1 The Contractor may not discriminate against a Subcontractor in the awarding of a subcontract because the Subcontractor is a minority, women, disabled veteran or emerging small business enterprise certified under ORS 200.055.

11.2 By entering into the contract, the Contractor certified it has not discriminated and will not discriminate, in violation of Subsection 11.1, against any minority, women, disabled veteran or emerging small business enterprise in obtaining any required subcontract.

11.3 If the Contractor violates the nondiscrimination certification made under Subsection 11.2, the City may regard the violation as a breach of contract that permits the City to terminate the contract or exercise any remedies for breach permitted under the contract.

12. HIGHEST STANDARDS; CONSEQUENCES FOR FAILURE – ORS 279B.060:

12.1 By entering into the Contract, Contractor agrees to perform the work to the highest standards prevalent in the industry or business most closely related to the work to be provided;

12.2 Contractor understands that failure to meet the highest standards in the industry may result in consequences including, but not limited to:

12.2.1 reducing or withholding of payment;
12.2.2 requiring Contractor to perform, at Contractor's own expense, additional work required to meet such standards; or

12.2.3 declaring a default, terminating the Contract and seeking damages and other relief available under the terms of the Contract or other applicable law.

13. **COMPLIANCE WITH LAWS:** The Contractor and Subcontractor shall comply with all federal, state and local laws, rules, ordinances and regulations at all times and in the performance of the contract.
CITY OF ROSEBURG
PUBLIC WORKS BOND FILING CERTIFICATION

Pursuant to ORS 279C.800 to 279C.870, I, undersigned contractor, do hereby certify that, prior to beginning work on the Project for which I have been awarded the bid by the City of Roseburg:

1. I have filed with the Construction Contractors Board ("Board"), a Public Works Bond in the amount of $30,000 with a corporate surety authorized to do business in the State of Oregon.
   _____ Yes _____ No (Check one)

2. I have elected not to file a Public Works Bond with the Board because I am a disadvantaged, minority, women, disabled veteran or emerging small business enterprise certified under ORS 200.055. I have provided the Board written verification of such certification and written notification of my election not to file the Public Works Bond. I understand that my election not to file the Public Works Bond will expire one year from the date it was filed and that a claim for unpaid wages may be filed against the payment bond I submitted on the Project.
   _____ Yes _____ No (Check one)

3. I have verified any subcontractor involved in the Project has, prior to beginning any work on this Project, either filed the Public Works Bond with the Board or has elected not to file the Public Works Bond because the subcontractor is a disadvantaged, minority, women, disabled veteran or emerging small business enterprise certified under ORS 200.055.
   _____ Yes _____ No (Check one)

   (a) I have verified that any subcontractor involved in this Project that has elected not to file the Public Works Bond has provided the Board written verification of its certification under ORS 200.055 and written notification of its election not to file the Public Works Bond.
      _____ Yes _____ No (Check one)

I understand the Public Works Bond described above is in addition to any other bond that I am required to provide, or that may be required by a subcontractor, for this Project.

Project Name: ____________________________________________

Project Number: __________________________________________

Contractor's Printed Name: _________________________________

Contractor’s Signature: ____________________________________

Dated: _____________________
CITY OF ROSEBURG
STANDARD PERFORMANCE BOND

Bond No.: ______________________________________________________
Solicitation: _____________________________________________________
Project Name: ____________________________________________________

__________________________________________ (Surety #1)   Bond Amount No. 1: $_____________________
__________________________________________ (Surety #2)*   Bond Amount No. 2: $_____________________

*If using multiple sureties   Total Penal Sum of Bond $_____________________

We, ___________________________ as Principal, and the above identified Surety(ies),
authorized to transact surety business in Oregon, as Surety, hereby jointly and severally bind
ourselves, our respective heirs, executors, administrators, successors and assigns, firmly by
these presents to pay to the City of Roseburg the sum of (Total Penal Sum of Bond)

(Provided that we the Sureties bind ourselves in such sum “jointly and severally” as well as
“severally” only for the purpose of allowing a joint action or actions against any or all of us, and
for all other purposes each Surety binds itself, jointly and severally with the Principal, for the
payment of such sum only as is set forth opposite the name of such Surety), and

WHEREAS, the Principal has entered into a contract with the City of Roseburg, the plans,
specifications, terms and conditions of which are contained in the above-referenced Solicitation;

WHEREAS, the terms and conditions of the contract, together with applicable plans, standard
specifications, special provisions, schedule of performance, and schedule of contract prices,
are made a part of this Performance Bond by reference, whether or not attached to the contract
(all hereafter called “Contract”); and

WHEREAS, the Principal has agreed to perform the Contract in accordance with the terms,
conditions, requirements, plans and specifications, and all authorized modifications of the
Contract which increase the amount of the work, the amount of the Contract, or constitute an
authorized extension of the time for performance, notice of any such modifications hereby being
waived by the Surety:

NOW, THEREFORE, THE CONDITION OF THIS BOND IS SUCH that if the Principal herein
shall faithfully and truly observe and comply with the terms, conditions and provisions of the
Contract, in all respects, and shall well and truly and fully do and perform all matters and things
undertaken by Contractor to be performed under the Contract, upon the terms set forth therein,
and within the time prescribed therein, or as extended as provided in the Contract, with or
without notice to the Sureties, and shall indemnify and save harmless the City of Roseburg and
members thereof, its officers, employees and agents, against any direct or indirect damages
or claim of every kind and description that shall be suffered or claimed to be suffered in
connection with or arising out of the performance of the Contract by the Principal or its
subcontractors, and shall in all respects perform said Contract according to law, then this
obligation is to be void; otherwise, it shall remain in full force and effect.
Nonpayment of the bond premium will not invalidate this bond nor shall the City of Roseburg be obligated for the payment of any premiums.

This bond is given and received under authority of ORS Chapters 279A, 279B and 279C, the provisions of which hereby are incorporated into this bond and made a part hereof.

IN WITNESS WHEREOF, WE HAVE CAUSED THIS INSTRUMENT TO BE EXECUTED AND SEALED BY OUR DULY AUTHORIZED LEGAL REPRESENTATIVES.

Dated this _______ day of ______________________, 2019.

PRINCIPAL: ________________________________

By

________________________________________
Signature

________________________________________
Official Capacity

Attest:

_______________________________________
Corporation Secretary

SURETY: _______________________
[Add signatures for each surety if using multiple bonds]

BY ATTORNEY-IN-FACT:
[Power-of-Attorney must accompany each surety bond]

_______________________________________
Name

_______________________________________
Signature

_______________________________________
Address

City       State       Zip

_______________________________________
Phone       Email
CITY OF ROSEBURG
PAYMENT BOND

Bond No.: ______________________________________________________
Solicitation: ______________________________________________________
Project Name: ______________________________________________________

________________________ (Surety #1) Bond Amount No. 1: $_____________________
________________________ (Surety #2)* Bond Amount No. 2: $_____________________
*If using multiple sureties

Total Penal Sum of Bond $_____________________

We, ___________________________ as Principal, and the above identified Surety(ies),
authorized to transact surety business in Oregon, as Surety, hereby jointly and severally bind
ourselves, our respective heirs, executors, administrators, successors and assigns, firmly by
these presents to pay to the City of Roseburg the sum of (Total Penal Sum of Bond)

(Provided that we the Sureties bind ourselves in such sum "jointly and severally" as well as
"severally" only for the purpose of allowing a joint action or actions against any or all of us, and
for all other purposes each Surety binds itself, jointly and severally with the Principal, for the
payment of such sum only as is set forth opposite the name of such Surety), and

WHEREAS, the Principal has entered into a contract with the City of Roseburg, the plans,
specifications, terms and conditions of which are contained in the above-referenced
Solicitation;

WHEREAS, the terms and conditions of the contract, together with applicable plans, standard
specifications, special provisions, schedule of performance, and schedule of contract prices,
are made a part of this Payment Bond by reference, whether or not attached to the contract
(all hereafter called “Contract”); and

WHEREAS, the Principal has agreed to perform the Contract in accordance with the terms,
conditions, requirements, plans and specifications, and schedule of Contract prices which are
set forth in the Contract and any attachments, and all authorized modifications of the Contract
which increase the amount of the work, or the cost of the Contract, or constitute authorized
extensions of time for performance of the Contract, notice of any such modifications hereby
being waived by the Surety:

NOW, THEREFORE, THE CONDITION OF THIS BOND IS SUCH that if the Principal shall
faithfully and truly observe and comply with the terms, conditions and provisions of the
Contract, in all respects, and shall well and truly and fully do and perform all matters and things
by it undertaken to be performed under said Contract and any duly authorized modifications
that are made, upon the terms set forth therein, and within the time prescribed therein, or as
extended therein as provided by the Contract, with or without notice to the Sureties, and shall
indemnify and save harmless the City of Roseburg and members thereof, its officers,
employees and agents, against any direct or indirect damages or claim of every kind and
description that shall be suffered or claimed to be suffered in connection with or arising out of
the performance of the Contract by the Contractor or its subcontractors, and shall promptly pay
all persons supplying labor, materials or both to the Principal or its subcontractors for
prosecution of the work provided in the Contract; and shall promptly pay all contribution due according to workers compensation requirements and the State Unemployment compensation Fund from the Principal or its subcontractors in connection with the performance of the Contract; and shall pay over to the Oregon Department of Revenue all sums required to be deducted and retained from the wages of employees of the Principal and its subcontractors pursuant to ORS 316.167, and shall permit no lien nor claim to be filed or prosecuted against the City on account of any labor or materials furnished; and do all things required of the Principal by the laws of this State, then this obligation shall be void; otherwise, it shall remain in full force and effect.

Nonpayment of the bond premium will not invalidate this bond nor shall the City of Roseburg be obligated for the payment of any premiums.

This bond is given and received under authority of ORS Chapters 279A, 279B and 279C, the provisions of which hereby are incorporated into this bond and made a part hereof.

IN WITNESS WHEREOF, WE HAVE CAUSED THIS INSTRUMENT TO BE EXECUTED AND SEALED BY OUR DULY AUTHORIZED LEGAL REPRESENTATIVES.

Dated this _______ day of ______________________, 2019.

PRINCIPAL: _______________________________
By _______________________________
Signature

Official Capacity

Attest: _______________________________
Corporation Secretary

SURETY: _______________________________
[Add signatures for each surety if using multiple bonds]

BY ATTORNEY-IN-FACT:
[Power-of-Attorney must accompany each surety bond]

Name

Signature

Address

City State Zip

Phone Email
“Lowest responsible bidder” means the lowest bidder who is not on the list established by the Construction Contractors Board pursuant to ORS 701.227 and who has:

1. Substantially complied with all prescribed public contracting procedures and requirements of the State of Oregon and the City of Roseburg;
2. Met the standards of responsibility described in ORS 279B.110 and 279C.375, and Roseburg Municipal Code Chapter 3.06; and
3. Not been disbarred or disqualified from bidding or debarred by the State of Oregon under ORS 279B.130 or 279C.440, or by the City under the provisions of Roseburg Municipal Code Chapter 3.06.

Project Name:____________________________________________________

Bid/Project Number:__________________________________________

Business Entity/ Bidder’s Name:____________________________________

CCB License Number:____________________________________________

Form submitted by City of Roseburg.
Form submitted by:
   Name:__________________________________________________________

   Title:__________________________________________________________

   Date:__________________________________________________________

The City has (check all of the following):

[ ] Checked the list created by the Construction Contractors Board under ORS 701.227 for bidders who are not qualified to hold a public improvement contract.

[ ] Determined whether the bidder has met the standards of responsibility. In so doing, the City has found that the bidder demonstrated that the bidder considered whether the bidder:

   [ ] Has available the appropriate financial, material, equipment, facility and personnel resources and expertise, or the ability to obtain the resources and expertise, necessary to meet all contractual responsibilities.

   [ ] Holds current licenses that businesses or service professionals operating in this state must hold in order to undertake or perform the work specified in the Contract.

   [ ] Is covered by liability insurance and other insurance in amounts required in the solicitation documents.
Qualifies as a carrier-insured employer or a self-insured employer under ORS 656.407, or has elected coverage under ORS 656.128.

Has disclosed the bidder’s first-tier subcontractors in accordance with ORS 279C.370.

Has a satisfactory record of performance.

Has a satisfactory record of integrity.

Is qualified legally to contract with the City.

Has supplied all necessary information in connection with the inquiry concerning responsibility.

Determined the bidder to be (check one of the following):

Responsible under ORS 279C.375(3)(a) and (b).

Not responsible under ORS 279C.375(3)(a) and (b).

If the City has found the bidder not to be responsible, please see attached document explaining the City’s determination.

Note: This form is to be submitted by the City of Roseburg to the Construction Contractors Board immediately following issuance of the City’s Notice of Intent to Award the subject contract. A copy must immediately be filed with the City Recorder.
Prevailing Wage Rates are the minimum wages that must be paid to all workers employed in the construction, reconstruction, major renovation or painting of all public works, unless specifically exempted by state or federal law. Rather than including the entire State and/or Federal Prevailing Wage Rate publications in the bid specifications and contract, public entities may make reference to the specific prevailing wage rate publication where the prevailing wage rates are found or provide a link to the specific prevailing wage rate publication where the prevailing wage rates are found.

Oregon Bureau of Labor and Industries Prevailing Wage Rates applicable to the subject project/contract are available on BOLI’s website at www.oregon.gov.boli. The prevailing wages to be applied throughout the duration of this project are those in effect for BOLI Prevailing Wage Rate Region 6, (Douglas County Oregon), upon the date the project is first advertised.

Federal Prevailing Wages Rates under the Davis Bacon Act (40 U.S.C. 3141 et seq.) may be found at www.wdol.gov. The prevailing wages to be applied throughout the duration of this project are those in effect for Federal Prevailing Wage Rates under the Davis Bacon Act (40 U.S.C. 3141 et seq.) at the time the initial specifications were first advertised for bid solicitations.

If the project is subject to both ORS 279C.800 to 279C.870 and to the Davis Bacon Act (40 U.S.C. 3414 et seq.), the contractor and every subcontractor shall pay the higher of the applicable state or federal prevailing rate of wage to all workers on the projects.

For specific information or questions regarding the Prevailing Wage Rate Law, you may log on to the above referenced websites or contact the nearest Oregon Bureau of Labor and Industries office listed below.

**BOLI Office Locations**

<table>
<thead>
<tr>
<th>City</th>
<th>Address</th>
<th>Phone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eugene</td>
<td>1400 Executive Parkway, Eugene, OR 97401</td>
<td>541/686-7623</td>
</tr>
<tr>
<td>Medford</td>
<td>700 E. Main, Suite 105, Medford, OR 97504</td>
<td>541/776-6270</td>
</tr>
<tr>
<td>Portland</td>
<td>800 NE Oregon St., #32, Portland, OR 97232</td>
<td>503/731-4074</td>
</tr>
<tr>
<td>Salem</td>
<td>3865 Wolverine St. NE, Bldg. E-1, Salem, OR 97305</td>
<td>503/378-3292</td>
</tr>
</tbody>
</table>

**THIS PROJECT IS SUBJECT TO THE OREGON BOLI PREVAILING WAGE RATES EFFECTIVE ON July 1st, 2019.**
GENERAL CONDITIONS

1. DEFINITIONS

1.1 Whenever used in these General Conditions or in the other Contract Documents, the following terms shall have the meanings indicated which shall be applicable to both the singular and plural thereof:

“Acceptance” means that the work has been completed in accordance with the Contract Documents and approved in writing by the Owner.

“Act of God or Nature” means a natural phenomenon of such catastrophic proportions or intensity as would reasonably prevent performance.

“Addendum” means any written document, signed by all parties, pertaining to additions, deletions, revisions or other issues with the Contract Documents issued after the Contract Documents have been issued.

"Bid" means the offer of a bidder to perform the work described by the Contract Documents when made out and submitted on the prescribed Bid Form and properly signed.

"Bidder" means any person, firm, partnership, corporation, limited liability company, or other entity submitting a bid for the work described hereunder.

“Change Order” means a document recommended by the Project Manager which is signed by the Contractor and the City and authorizes an addition, deletion or revision in the work or an adjustment in the Contract price or Contract times, issued on or after the effective date of the Contract.

"City" means the City of Roseburg located in the State of Oregon, and owner of the Project and work related thereto.


"Contractor" means the firm, partnership, corporation, limited liability company, or other entity executing the Contract with the City for the performance of the work herein described.

“Defective” means, when modifying the work, refers to work that is unsatisfactory, faulty or deficient in that it:
a. does not conform to the Contract Documents; or

b. does not meet the requirements of any applicable inspection, reference standard, test or approval referred to in the Contract Documents; or

c. has been damaged prior to the Project Manager's recommendation of final payment (unless responsibility for the protection thereof has been assumed by the City at Substantial Completion in accordance with the Contract Documents).

“Design Consultant” means the firm who prepared the Plans and Specifications and shall not mean the Project Manager.

"Engineer" means the City's authorized Engineer, as designated by the City Manager or Public Works Director for the Contract, either acting directly or through the inspector, within the scope of assigned duties.

“Final Completion” means that all work has been completed in conformance with the Contract Documents and the Contract has been fully performed.

“Holidays” means any Oregon legal holiday.

“Liquidated Damages” means that which is set forth in Subsection 6.9 herein.

“Milestone” means a principal event specified in the Contract Documents relating to an intermediate completion date or time prior to Substantial Completion of all of the work.

"Payment Bond” means the approved form of security furnished by the Contractor and Contractor's Surety as a guarantee of good faith on the part of the Contractor to make all payments that are the Contractor's obligations, in accordance with the terms of the Contract.

“Performance Bond” means the approved form of security furnished by the Contractor and Contractor's Surety as a guarantee of good faith on the part of the Contractor to execute the work that is the Contractor's obligation, in accordance with the terms of the Contract.

"Plans" means and includes the City approved maps, standard drawings, work order drawings and supplemental drawings and sketches which will show the locations, character, dimensions and details of the work to be done.

"Project" means all work described and specified herein and as indicated on the Plans.

“Project Manager” means the City’s authorized Project Manager for the Contract, as designated by the City Manager or Public Works Director, either acting directly or through a designated representative, within the scope of assigned tasks.

“Proposal Request” means a written statement issued by the Project Manager to the Contractor on or after the effective date of the Contract and signed by the City and the Contractor identifying additions, deletions or revisions in the work, or responding to
differing or unforeseen subsurface or physical conditions under which the work is to be performed or to emergencies. A Proposal Request will not change the Contract price or the Contract times but is evidence that the parties expect that the change ordered or documented by a Proposal Request will be incorporated in a subsequently issued Change Order.

“Public Works Bond” means a $30,000 form of security furnished by the Contractor and/or Subcontractor and Contractor’s and/or Subcontractor’s Surety to the Construction Contractors Board to pay claims ordered by the Bureau of Labor and Industries to workers performing labor under a public works project.

“Punch List” means a list developed by the Project Manager after Substantial Completion that identifies defects or deficient workmanship or work not completed in conformance with the Contract Documents.

“Request for Information” means a formal request from the Contractor to the Project Manager requesting clarification and/or direction necessary to complete the work.

"Specifications" means and includes the directions, provisions and requirements contained herein and referred to herein pertaining to the Project.

“Submittals” means all drawings, diagrams, material data, schedules and other information which are specifically prepared or assembled by or for the Contractor and submitted by the Contractor to illustrate some portion of the work.

“Substantial Completion” means that the degree of completion of the Project, or portion of the Project as evidenced by the Project Manager’s written notice of Substantial Completion, sufficient to provide the City, the full-time use of the Project, or portion of the Project, for the purpose for which it was intended. Determination of Substantial Completion is solely at the discretion of the Project Manager. Substantial Completion does not mean complete in accordance with the Contract nor shall Substantial Completion of all or any part of the Project entitle the Contractor to final acceptance under the Contract. The criteria the Project Manager may use in exercising his/her discretion in determining Substantial Completion includes, but is not limited to, the completion of all equipment contained in the Project, or portion of the Project, all other components necessary to enable the City to operate the facility in the manner that was intended.

"Superintendent" means the executive representative of Contractor, authorized to receive and fulfill instructions from the Project Manager or Project Manager’s representatives.

"Supplemental Specifications" means specific instructions setting forth conditions or requirements peculiar to the Project under consideration when said Project is not completely covered by the Specifications contained herein.

"Surety" means the person, firm, partnership, corporation, limited liability company or other entity that has the requisite authority to execute the bonds required from the Contractor.
2. CONTRACT DOCUMENTS

2.1 Award, Execution of Documents, Delivery of Bonds.

2.1.1 If awarded, the Contract will be awarded to the lowest responsible bidder whose qualifications indicate the award will be in the best interest of the City and whose bid complies with all the prescribed requirements. No award will be made until the City has concluded such investigations as the City deems necessary to establish the responsibility, qualifications and financial ability of the Bidders to do the work in accordance with the Contract Documents.

2.1.2 In determining the lowest responsible bidder for the purpose of awarding the Contract, the City, pursuant to ORS 279A.120 shall:

2.1.2.1 give preference to goods and services that have been manufactured or produced in Oregon if the price, fitness, availability and quality are otherwise equal; and

2.1.2.2 add a percentage increase on the bid of a nonresident bidder equal to the percent, if any, of the preference given to that bidder in the state in which the bidder resides.

2.1.3 The City reserves the right to reject any and all bids not in compliance with all public bidding procedures and requirements or when such rejection is in the interest of the City; to reject the bid of a bidder who has previously failed to perform properly or complete contracts of a similar nature on time; and to reject the bid of a bidder who is not, in the opinion of the City, in a position to perform the Contract. If the Contract is awarded, the City will give the successful bidder written notice of award within forty-five (45) calendar days after bid opening.

2.1.4 At least three (3) counterparts of the Construction Contract and such other Contract Documents as practicable will be signed by the City and Contractor. The Contractor shall receive one (1) executed counterpart of the Contract Documents.

2.1.5 When required by the specifications, the Contractor shall deliver simultaneously with the execution of the Contract Documents a good and sufficient Payment Bond to ensure payment of the obligations incurred in the performance of this Contract, a Performance Bond to assure performance of the Contract and the Public Works Bond Filing Certification form executed by the Contractor. No exceptions will be made to this provision.

2.1.6 Failure of the successful bidder to execute the Contract Documents and deliver the required Payment Bond, Performance Bond and Public Works Bond Filing Certification form within ten (10) calendar days of the notification of the award of the Contract shall be just cause for the City to annul the award.
2.2 Correlation, Interpretation, and Intent of Contract Documents.

2.2.1 The intent of the Plans and Specifications as contained herein is to describe the complete Project which the Contractor shall undertake to do in full compliance with the Construction Contract with Exhibit “A”, Plans and Specifications. The Contract Documents comprise the entire agreement between the City and the Contractor. The Contract Documents may only be altered as provided in the General Conditions of the Contract.

2.2.2 The Plans and Specifications are intended to be explanatory and complimentary of each other. Contractor shall execute any work indicated in the Plans and not in the Specifications, or vice versa, as if indicated in both. Should any work or materials be reasonably required or intended for carrying the Project to satisfactory completion, which is inadvertently omitted on the Plans and Specifications, Contractor shall furnish the same as fully as if particularly delineated or described. Should it appear that the work to be done or any of the matters relative thereto are not sufficiently detailed or explained in the Contract Documents, the Contractor shall apply to the Project Manager for further explanations as may be necessary and shall conform thereto so far as may be consistent with the terms of the Contract. In the event any doubt or question arising respecting the true meaning of the Plans or Specifications, Contractor may seek a determination by the Project Manager according to Subsection 3.2 and Paragraph 3.3.3. Should the Contractor disagree with the Project Manager’s decision, the Contractor may appeal to the City Manager in accordance with Paragraph 3.4.2. In resolving such conflicts, errors and/or discrepancies, the Contract Documents shall be given precedence in the following order: Construction Contract with Exhibit “A”, the Plans and the Specifications. Within the Specifications, the order of precedence shall be as follows: General Conditions, Information for Bidders, Special Conditions and Technical Provisions.

2.2.3 Figure dimensions on Plans shall govern over scale dimensions, and detailed drawings shall govern over general drawings. Any work that may reasonably be inferred from the Plans and/or Specifications as being required to produce the intended result shall be supplied whether or not it is specifically called for. Work, materials or equipment described in words which so applied have a well-known technical or trade meaning shall be deemed to reference such recognized standards. The Contractor assumes full responsibility for having familiarized himself with the nature and extent of the Contract Documents, work locality and local conditions that may in any manner affect the work to be done.

2.3 Verification and Warranty. The Contractor shall make the determination of the nature of the work proposed under the Contract, local conditions which can be encountered within the Project area and all other matters which can in any way affect the work proposed under the Contract. It shall also be the responsibility of the Contractor to be thoroughly familiar with the Contract Documents. Failure to make the examination necessary for this determination or to examine any form, instrument or document of the Contract with Exhibit “A” shall not release the Contractor from the obligations of the Contract with Exhibit “A”. The Contractor warrants that no oral or written agreement or conversation with any officer, agent or employee of the City, either before or after the
execution of the Contract, has affected or modified any of the terms or obligations herein contained.

2.4 **Documents to be Kept on the Jobsite.** The Contractor shall keep at least one (1) copy of the Contract Documents at the jobsite, in good order, available to the Project Manager.

2.5 **Additional Contract Documents.** The City will furnish to the Contractor, on request and free of charge, up to three (3) copies of the Contract Documents. Additional copies of Contract Documents may be obtained upon request by paying the actual cost of reproduction.

2.6 **Surveys.** When required for the Project, surveying and staking of the component parts of the work shall be as detailed in the Specifications and on the Plans. The Contractor shall construct the work in accordance with the construction stakes and shall be charged with full responsibility for conformity and agreement of the work with said construction stakes.

3. **PROJECT MANAGER-CITY-CONTRACTOR RELATIONS**

3.1 **General.** The City has the authority to act as the sole judge of the work with respect to both quantity and quality as set forth in the Contract. It is expressly stipulated that the Plans, Specifications and other Contract Documents set forth the requirements as to the nature of the completed work and do not purport to control the method of performing work except in those instances where the nature of the completed work is dependent on the method of performance.

3.2 **Project Manager.** The Project Manager is the representative of the City and is employed to act as advisor and consultant to the City in project managing matters related to the Contract. The City has delegated its authority to the Project Manager to make initial decisions regarding all claims and questions, which may arise as to the quality or acceptability of materials furnished and work performed and as to the manner of performance and rate of progress of the work under the Contract. The Project Manager determines the intent and meaning of the Contract and makes initial decisions with respect to the Contractor's fulfillment of the Contract and the Contractor's entitlement to compensation. Should the Contractor disagree with a decision of the Project Manager with respect to the Contract, the Contractor may request that the City Manager review the Project Manager's decision and make a determination in the manner provided under Paragraph 3.4.2.

The Project Manager may designate a field representative as an alternate in his/her capacity on the job site. All notifications required under the Contract shall be made directly to the Project Manager or the designated representative.

3.3 **Duties and Responsibilities of the Project Manager**

3.3.1 The Project Manager will make periodic visits to the site of the Project to observe the progress and quality of the work and to determine, in general, if the work is proceeding in accordance with the intent of the Contract Documents. The
Project Manager shall not be required to make comprehensive or continuous inspections to check the quality or quantity of the work, and shall not be responsible for construction means, methods, techniques, sequences or procedures, or for safety precautions and programs in connection with the Project. Visits and observations made by the Project Manager shall not relieve the Contractor of obligations to conduct comprehensive inspections of the work, to perform acceptable work and to provide adequate safety precautions.

3.3.2 The Project Manager or the field representative thereof will be assigned to periodically observe the work and to act in matters of construction under the Contract. It is understood the Project Manager or field representative shall have the power to issue instructions and make decisions within the limitations of the authority granted by the City. Such inspection shall not relieve the Contractor of obligations to conduct comprehensive inspections of the work, perform acceptable work and provide adequate safety precautions.

3.3.3 All claims of the Contractor shall be presented to the Project Manager or designated representative, for a decision which shall be made in writing within a reasonable time. All decisions of the Project Manager shall be final subject only to the Contractor’s right to appeal the Project Manager’s decision to the City Manager in the manner provided in Subsection 3.4.

3.4 Appeal to the City Manager by the Contractor.

3.4.1 Determination by the Project Manager. As provided in Subsections 3.1, 3.2, and 3.3, the Contractor shall refer questions regarding meaning and intent of the Contract Documents in writing to the Project Manager for his/her decision. The Project Manager shall, within a reasonable time, respond to the Contractor in writing with his/her decision. If the Contractor disagrees with the Project Manager’s decision or considers the decision requires extra work, Contractor may appeal the decision to the City Manager. Any related work performed by the Contractor prior to the Project Manager’s decision is done at Contractor’s risk unless otherwise authorized by the Project Manager.

3.4.2 City Manager Appeal Process. In the event the Contractor disagrees with any decision of the Project Manager, the Contractor may, within ten (10) calendar days of the date of such decision, appeal the decision to the City Manager for review. The appeal must be in writing and must set forth the questions referred to the Project Manager, the Project Manager’s decision and the Contractor’s basis for disagreement. The Contractor shall deliver a copy of the appeal to the Project Manager at the time it is filed with the City Manager. The City Manager shall make all reasonable efforts to review the appeal and deliver his/her decision in writing to the Contractor within thirty (30) calendar days from the date of receipt of the appeal. Failure of the Contractor to appeal the decision of the Project Manager within the said ten (10) calendar day period constitutes a knowing and voluntary waiver of the Contractor’s right to thereafter assert any claim resulting from such decision. This procedure is not meant to preclude or discourage informal resolution of disagreements between the Project Manager and the Contractor.
In the event the City Manager elects to do so, the City Manager may establish a “Claims Review Board” either to assist in reviewing an appeal hereunder or to consider Contractor appeals directly. Once established, the Claims Review Board will hear all future appeals of claims for this Contract.

During the pendency of any appeal, any related work performed by the Contractor shall be done at the Contractor’s risk unless otherwise authorized by the Project Manager.

The filing of an appeal does not automatically extend the milestones and/or deadlines set forth in the Contract Documents and the Contractor continues to be subject to liquidated damages for failure to complete the Project within the time allotted.

In the event the City Manager or the Contractor commences arbitration or other legal action against the other for damages or for equitable relief, the prevailing party in such arbitration or other legal action is entitled to recover its reasonable attorney’s fees therein and in any appeal therefrom.

The parties hereby stipulate and consent that venue for all arbitration or other legal actions arising under the Contract is in Douglas County, Oregon and that jurisdiction for all legal actions that are brought in or transferred to court is in the Douglas County Circuit Court of the State of Oregon; except, if a claim must be brought in a federal forum, then it must be brought and adjudicated solely and exclusively in the United States District Court for the District of Oregon located in Eugene, Oregon.

3.5 Suspension of Work. The Project Manager shall, in addition to its other authority, have the authority to suspend the work, wholly or in part, for such period or periods as may be deemed necessary due to unsuitable weather or such other conditions as are considered unfavorable for prosecution of the work, or failure on the part of the Contractor to carry out the provisions of the Contract. The Contractor shall not suspend operation without the permission of the Project Manager or Project Manager's authorized representative.

3.6 Notice of Potential Claim for Additional Compensation and/or Time.

3.6.1 The Contractor shall not be entitled to any additional compensation or extension of  time for any act or failure to act by the Project Manager or the City, the happening of any event or occurrence or any other cause, unless the Contractor shall have given the Project Manager a written notice of potential claim.

3.6.2 The written notice of potential claim shall set forth the reasons for which the Contractor believes additional compensation or time will or may be due, the nature of the costs involved and insofar as possible, the amount of the potential claim. If based on an act or failure to act by the Project Manager or the City, except in case of emergency, such notice shall be given to the Project Manager
prior to the time that the Contractor starts performance of the work giving rise to the potential claim for additional compensation. In all other cases, notice shall be given within ten (10) calendar days after the happening of the event or occurrence giving rise to the potential claim.

3.6.3 It is the intention of this section that differences between the parties arising under and by virtue of the Contract shall be brought to the attention of the Project Manager at the earliest possible time in order that such matters may be settled if possible or other appropriate action may be taken promptly.

3.7 Examination of Completed Work. If the Project Manager requests it, the Contractor at any time before acceptance of the Project by the City, shall remove or uncover such portions of the finished work as may be directed. After examination, the Contractor shall restore said portions of the work to the standards required by the Contract Documents. Should the work thus exposed or examined prove to be in accordance with the Contract Documents, the uncovering or removing, the replacing of the covering or making good of the parts removed, shall be paid for by the City; but should the work so exposed or examined prove to be not in accordance with the Contract Documents, the uncovering or removing and the replacing of the covering or the making good of the parts removed, shall be at Contractor's expense. Should any work be performed without giving notice of plan of work, thereby eliminating an opportunity of inspection by the Project Manager, the Project Manager may require the Contractor to uncover such work at Contractor's own expense for examination by the Project Manager. Cost of uncovering such work shall be borne by the Contractor, whether or not the work is found acceptable. The work shall also be subject to inspection by appropriate governmental inspectors at all times.

3.8 Contractor's Superintendent. A qualified superintendent, who is acceptable to the Project Manager, shall be maintained by the Contractor on the Project to give efficient supervision over the Project until its completion. The superintendent shall have full authority to act on behalf of the Contractor, and all directions given to the superintendent shall be considered given to the Contractor. In general, the Project Manager's instructions shall be confirmed in writing and always upon written request from the Contractor.

3.9 Information Regarding Existing Facilities and Utilities.

3.9.1 Facilities. Any information relative to the location of other structures as might be shown on the Contract Documents will be obtained from the best information available and field observations; however, the City cannot guarantee the accuracy or completeness of this information.

3.9.2 Utilities. The Design Consultant has endeavored to determine the existence of utilities at the job site from the records of positions of these utilities as derived from such records as are shown on the Drawings. No excavations were made to verify the location shown for underground utilities. The service connections to these utilities are not shown on the Drawings. It is the responsibility of the Contractor to determine the exact location of all utilities and service connections hereto. The Contractor shall make its own investigations, including contacting the owners of appropriate utilities and making exploratory
excavations to determine the locations and type of existing utilities, including service connections, prior to commencing work that could result in damage to such utilities and/or surrounding structures. The Contractor shall immediately notify the Project Manager as to any utility discovered by the Contractor that is not shown on the Drawings or that is in a different position than shown on the Drawings.

In the event it is necessary to remove, relocate or temporarily maintain a utility because of interference with the work, the Contractor shall perform the work on the utility and the City shall pay Contractor as follows:

3.9.2.1 When it is necessary to remove, relocate or temporarily maintain a service connection, the cost of which is not required to be borne by the owner thereof, the Contractor bears all expenses incidental to the work on the service connection. The Contractor shall perform the work on the service connection in a manner satisfactory to the owner thereof; if being understood that the owner of the service connection has the option of doing such work with its own forces, or permitting the work to be done by the Contractor.

3.9.2.2 When it is necessary to remove, relocate or temporarily maintain a utility or underground obstruction that is in the position shown on the Drawings, the cost of which is not required to be borne by the owner thereof, the Contractor bears all expenses incidental to the work on the utility. The Contractor shall perform the work on the utility in a manner satisfactory to the owner thereof; it being understood that the owner of the utility has the option of doing such work with its own forces, or permitting the work to be done by the Contractor.

3.9.2.3 When it is necessary to remove, relocate or temporarily maintain a utility or underground obstruction that is not shown on the Drawings or is in a position different from that shown on the Drawings and were it in the position shown on the Drawings would not need to be removed, relocated or temporarily maintained, the cost of which is not required to be borne by the owner thereof, the City will make arrangements with the owner of the utility for such work to be done at no cost to the Contractor.

No representations are made that the obligations to move or temporarily maintain any utility and to pay the cost thereof, is or is required to be borne by the owner of such utility, and it is the responsibility of the Contractor to investigate to determine whether or not said cost is required to be borne by the owner of the utility.
Governmental agencies and owners of utilities reserve the right to enter at any time upon any street, alley, right-of-way or easement for the purpose of making changes in their property made necessary by the work and for the purpose of maintaining and making repairs to their property.

3.10 Use of Premises

3.10.1 All work included under the Contract is to be constructed on land belonging to the City, on public right-of-way administered and regulated by state and/or local government or on easements to the benefit of the City or the public. The Contractor shall abide by special conditions or requirements of the property owner or governing authority. The Contractor shall confine equipment, the storage of materials and the operation of Contractor's workers to the limits as shown on the Plans or as indicated by law, ordinances, permits or directions of the Project Manager and shall not unreasonably encumber the premises with materials.

3.10.2 Any additional land and access thereto which the Contractor might desire for temporary construction facilities or for storage of materials shall be provided by the Contractor with no liability to the City. The Contractor shall pay all costs involved in acquiring such rights and all clean up shall be made as required by these Specifications.

3.11 Private Property. The Contractor shall not enter upon private property for any purpose without obtaining permission and shall be responsible for the preservation of all public property, trees, monuments, etc. along and adjacent to the street and/or right-of-way, and shall use every precaution necessary to prevent damage or injury thereto. The Contractor shall use suitable precautions to prevent damage to pipes, conduits and other underground structures, including but not limited to, verifying with all appropriate utilities where underground structures are located, and shall protect carefully from disturbance or damage all monuments and property marks until an authorized agent has witnessed or otherwise referenced their location and shall not remove them until directed.

3.12 Assignment of Contract. Contractor shall not sublet, sell or assign the Contract or sublet any of the work to be performed hereunder without the written consent of the City. Any such assignment or subletting of any such work without City's consent shall be null and void and without force or effect.

3.13 City's Right to do Work. If, in the sole opinion of the Project Manager, the Contractor neglects to prosecute the work properly or neglects or refuses at Contractor's own cost, to take up and replace work that has been rejected by the Project Manager, the Project Manager shall notify the City who shall notify the Surety of the condition. After at least ten (10) calendar days written notice to the Contractor and the Contractor's Surety, or without notice if an emergency or danger to the Project or public exists, and without prejudice to any other right which the City may have under the Contract, the City may take over that portion of the Project which has been improperly executed, make good the deficiencies and deduct the actual costs thereof from the payments then or thereafter
due the Contractor. If no amount is owed to the Contractor, then the City may still pursue all of its other legal and/or equitable remedies.

3.14 City’s Right to Terminate Contract.

3.14.1 Upon occurrence of any one or more of the following, the City may terminate the Contract at any time, immediately or upon such notice as the City in its sole discretion deems appropriate, by providing written notice to the Contractor which describes the reason for termination:

3.14.1.1 Contractor persistently fails to perform the work in accordance with the Contract Documents, including but not limited to, failure to supply sufficient skilled workers, suitable materials or equipment and failure to adhere to the progress schedule as the schedule may be revised from time to time;

3.14.1.2 Contractor fails to comply with applicable laws or the provisions of any of the Contract Documents, including, but not limited to the Construction Contract with Exhibit “A” Standard City Contract Provisions;

3.14.1.3 Contractor disregards the authority of the Project Manager;

3.14.1.4 Contractor violates any provision of the Contract and, after receiving notice of the violation, fails to remedy the breach immediately; or

3.14.1.5 Contractor files for bankruptcy under any chapter of the Bankruptcy Code (Title 11, United States Code); or a petition in bankruptcy is filed against Contractor under the Bankruptcy Code or any other provision of law seeking substantial relief; or Contractor makes a general assignment for the benefit of creditors; or a trustee, receiver or similar agent is appointed to take charge of Contractor’s property for the benefit of creditors; or Contractor otherwise admits in writing to being unable to pay its debts as they become due.

3.14.2 Upon the City’s issuance of written notice of termination, the Contractor shall immediately cease all work under this Contract, unless, as shall be specified in the notice, the City, in its sole discretion, would be harmed by any uncompleted work, in which case, Contractor shall complete those items specified by the City in its notice.

3.14.3 The City may terminate the Contract upon seven (7) calendar days’ notice if the City determines for any reason that the completion of the Contract is no longer in the best interests of the City.

3.14.4 If the City terminates the Contract pursuant to Paragraph 3.14.1, the City may choose any remedy available to it under the Contract, applicable statutes,
City Code or common law, including but not limited to, completing the Project itself or through another contractor. The Contractor shall pay the City for all additional costs incurred by the City to obtain substitute performance. The Contractor shall be entitled to payment for that portion of the work that the Contractor completed according to the Contract, less the City's costs to obtain substitute performance for the balance of the work.

3.14.5 If the City terminates the Contract pursuant to Section 3.14.3, the City shall pay Contractor for that portion of the work the Contractor has completed according to the Contract, plus Contractor's cost for materials ordered and delivered to the site before Contractor receives the City's notice of termination; provided that such materials shall then belong to the City.

3.15 **Contractor's Right to Stop Work or Terminate Contract.** The Contractor may suspend work or terminate the Contract upon ten (10) calendar days written notice to the City, for any of the following reasons:

3.15.1 If an order of any court or other public authority caused the work to be stopped or suspended for a period of ninety (90) calendar days through no act or fault of the Contractor or his employees;

3.15.2 If the City should fail to act upon any request for payment within thirty (30) calendar days after its approval by the Project Manager; or

3.15.3 If the City should fail to pay the Contractor any sum within thirty (30) calendar days after its award by arbitrators.

3.16 **Rights of Various Interests.** Wherever work being done by the City's forces is contiguous to work covered by the Contract, the respective rights of the various interests involved shall be established by the Project Manager to secure the completion of the various portions of the work in general harmony.

3.17 **Subcontracts.**

3.17.1 The Contractor shall not be permitted to subcontract any of the work to be performed under the Contract without the written consent of the City, submission of the First-Tier Subcontractor Disclosure Form as required prior to the Bid opening deadline and verification that the Subcontractor has filed a Public Works Bond, when required, with the Construction Contractors Board prior to beginning any work on the Project. The Contractor shall not employ any subcontractor that the Project Manager may object to due to subcontractor lacking the capability of performing work of the type and scope anticipated. No changes will be allowed from the approved subcontractor list without approval of the Project Manager.

3.17.2 The Contractor agrees to be as fully responsible to the City for the acts and omissions of the Contractor's subcontractors or of any persons either directly or indirectly, employed by Contractor's subcontractors as Contractor is for the acts and omissions of persons directly employed by Contractor.
3.18 **Unforeseen Difficulties.** The Contractor shall protect the work and materials from damage due to the nature of the work, the elements, carelessness of other contractors or from any cause whatever until completion and acceptance of the Project. All loss or damages arising out of the nature of the work to be done under the Contract Documents, from any unseen obstruction or defects which may be encountered in the prosecution of the work, or from the action of the elements, shall be sustained by the Contractor.

3.19 **Work During an Emergency.** The Contractor shall be responsible for and must have resources available for all emergency work which might occur on the Project under construction for which the Contractor is responsible. The Contractor shall perform any work and furnish and install any materials and equipment necessary during an emergency endangering life or property. In all cases the Contractor shall notify the Project Manager of the emergency as soon as practicable, but the Contractor shall not wait for instructions before proceeding to properly protect both life and property.

3.20 **Oral Agreements.** No oral order, objection, claim or notice by any party to the others shall affect or modify any of the terms or obligations contained in any of the Contract Documents. No provision of the Contract Documents shall be held to be waived or modified by reason of any act whatsoever, other than by a definitely agreed waiver or modification thereof in writing. No evidence shall be introduced in any proceeding of any other waiver or modification.

3.21 **Liens and Claims Against Contractor.** The Contractor shall not permit any lien or claim to be filed or prosecuted against the City on account of any labor or material furnished under this Contract whether the same be furnished by the Contractor or any Subcontractor. If the Contractor fails, neglects or refuses to make prompt payment of any claim for labor or services furnished to the Contractor or a Subcontractor by any person in connection with the Contract as such claim becomes due, the City may pay such claim to the person furnishing the labor or services and charge the amount of the payment against funds due or to become due to the Contractor under this Contract. The payment of a claim in this manner does not relieve the Contractor or its surety from obligation with respect to any unpaid claims.

Any claim, by a person claiming to have supplied labor or materials for the performance of the work, for payment asserted against the Contractor’s payment bond must be asserted in conformity with ORS 279C.600 et. Seq.

4. **MATERIALS AND WORKMANSHIP**

4.1 **Materials to be Reviewed Before Use.**

4.1.1 Only materials conforming with the specified requirements and conditionally accepted by the Project Manager shall be used in the Project.

4.1.2 Before any material to be used in the Project is delivered, the Contractor shall advise the Project Manager of the source from which the material is to be
obtained, furnish such samples as may be required for testing purposes, and receive the Project Manager’s conditional acceptance for the use of that particular material. The conditional acceptance of any source of supply by the Project Manager does not imply that all material from that source will be accepted. Should material from any conditionally accepted source fail to maintain a quality meeting the requirements of the Specifications, use of material from that source shall be discontinued and the Contractor shall furnish acceptable material from other sources. Regardless of the source, any material delivered for the Project which fails to meet the requirements will be rejected. Only material meeting all requirements will be allowed to be incorporated in the Project. Any material or item incorporated in the Project which does not meet requirements of the Contract Documents, even if it was used with the consent and/or the presence of an inspector, shall be removed and acceptable material shall be used in its place, with all costs related to such removal and installation being borne by the Contractor.

4.1.3 Any material which, after conditional acceptance, has for any reason become unsuitable for use shall be rejected and not used.

4.2 Tests of Materials.

4.2.1 All tests of materials shall be made in accordance with acceptable methods as described and designated in the Specifications. When tests of materials are required, such tests shall be made by a testing laboratory accepted by the Project Manager and at the expense of the Contractor. The Contractor shall afford such facilities as may be required for collecting and forwarding samples and shall hold the materials represented by the samples until tests have been made and the materials found equal to the requirements of the Specifications or to approved samples. The Contractor in all cases shall furnish the required samples without charge.

4.2.2 In the absence of any definite Specification or reference to a Specification in the Technical Specifications or in the Special Provisions for the particular Project involved, it shall be understood that such materials shall meet the Specifications and requirements of the American Society for Testing Materials. Unless otherwise specified, all tests of materials shall be made in accordance with the methods prescribed by the American Society for Testing Materials.

4.2.3 In cases where compliance of materials or equipment with Contract requirements is not readily determinable through inspection and tests, the Project Manager shall request the Contractor provide properly authenticated documents, certificates or other satisfactory proof of compliance. These documents, certifications and proofs must cover performance characteristics, materials or construction and the physical or chemical characteristics of materials.

4.2.4 If the Specifications require, or the Contractor’s request is approved by the Project Manager, inspection or testing may take place away from the job site. The additional cost to the City for such remote inspection or testing includes travel and subsistence expenses and will be paid by the Contractor through a reduction.
in payment to the Contractor equal to the travel and subsistence expenses. In the event the remote inspection or testing is not specified and is required by the City, the required travel and subsistence expense will be paid for by the City.

4.3 **Storage of Materials.** Materials shall be so stored as to insure the preservation of their quality and fitness for the Project. When considered necessary, they shall be placed on wooden platforms or other hard, clean surfaces, and not on the ground, and/or they shall be placed under cover. Stored materials shall be located so as to facilitate prompt inspection. Private property shall not be used for storage purposes without the written permission of the City and the private property owner.

4.4 **Character of Workers.** The Contractor shall at all times be responsible for the conduct and discipline of Contractor's employees and/or any subcontractor or persons employed by subcontractors. All workers must have sufficient knowledge, skill and experience to properly perform the work assigned to them. Any foreman or worker employed by the Contractor or Subcontractor who, in the opinion of the Project Manager, does not perform the work in a skillful manner, appears to be incompetent or acts in a disorderly or intemperate manner shall, at the written request of the Project Manager, be removed from work on any portion of the Project except as allowed by the Project Manager.

4.5 **Construction Means, Methods, Techniques, and Procedures.** The Contractor shall have the full power and authority to select the means, methods, techniques and procedures for performing the work covered under the Contract, provided said means, methods, techniques and procedures are in strict compliance with the requirements of all local, state and federal authorities and with these Specifications, and are not in conflict with the recommended installation practices of the manufacturers who are the suppliers of the materials to be utilized on the contemplated Project. The construction means, methods, techniques and procedures utilized shall produce a satisfactory quality of workmanship and shall be adequate to maintain the schedule of progress as required under the provisions of these Specifications.

4.6 **Contractor's Tools and Equipment.** The Contractor's tools and equipment used on the work covered under the Contract shall be furnished in sufficient quantity and of a capacity and type that will safely perform the work specified, and shall be maintained and used in a manner that will not create a hazard to persons or property, or cause a delay in the progress of the work.

4.7 **Rejected Materials and Work.** Any material supplied by the Contractor which is condemned or rejected by the Project Manager or the Project Manager's authorized representative because of non-conformity with the Contract Documents shall be removed at once from the vicinity of the Project by the Contractor at his own expense, and the same shall not be used on the Project. Any defective work whether the result of poor workmanship, use of defective materials, damage through carelessness or any other cause shall be removed within ten (10) calendar days after written notice is given by the Project Manager, and the work shall be re-executed by the Contractor at his own expense.

4.8 **Unnoticed Defects.** Any defective work or materials furnished by the Contractor and discovered by the Project Manager before the Project has been given final acceptance
or final payment has been made, or during the guarantee period, shall be removed and replaced by work and materials which shall conform to the provisions of the Contract Documents. Failure on the part of the Project Manager or his representative to condemn or reject bad or inferior work or materials shall not be construed to imply acceptance of such work or materials.

4.9 **Right to Retain Imperfect Work.** If any part or portion of the work done or material furnished by the Contractor under the Contract proves to be defective and not in accordance with the Plans and Specifications, and if the imperfection in the same is not of sufficient magnitude or importance as to make the work dangerous or unsuitable, or if the removal of such work will create conditions which are dangerous or undesirable, the City shall have the right and authority to retain such work but shall make such deductions in the payment therefore as may be just and reasonable.

4.10 **Correction of Defective Work.** When, and as often as the Project Manager determines through its inspection procedures, material, equipment or workmanship incorporated in the Project do not meet the requirements of the Contract, the Project Manager may give notice of the noncompliance to the Contractor in writing. Within five (5) calendar days of receipt of such notice, the Contractor shall undertake all work necessary to correct the deficiency and to comply with the Contract. The Contractor agrees to pay all costs of correcting the defective work, including wages and overhead charges for inspection. If the Contractor disagrees with the Project Manager’s determination and believes the corrective work should be covered by a Change Order, the Contractor shall immediately notify the City, in writing, setting forth the basis for its position. The City will review the matter and notify the Contractor, in writing, of its determination within thirty (30) calendar days after receipt of the Contractor’s notification. If the City determines the corrective work is required to comply with the Contract, the Contractor shall proceed with such work.

As a condition precedent to the Contractor’s claim for either additional compensation or time extension or both resulting from the performance of such corrective work, the Contractor shall, within fifteen (10) calendar days after receipt of the City’s determination, notify the City in writing of its intent to claim additional compensation, time or both. The Contractor shall document all cost information associated with the corrective work and shall submit such information to the Project Manager on a monthly basis. Receipt of the cost data by the Project Manager does not constitute an Acceptance of the corrective work or an authorization for a Change Order to cover the corrective work.

4.11 **Cutting and Patching.** The Contractor shall do, or be responsible for, all cutting, fitting or patching that may be required by, shown on or reasonably implied by the Plans and Specifications. Any defective work performed or material furnished by the Contractor, which is discovered by the Project Manager before final acceptance of the Project or before final payment has been made, shall be removed and replaced or patched at the Contractor’s expense in a manner approved by the Project Manager or his representative.
4.12 Cleanup.

4.12.1 As the Project progresses and immediately after completion of the Project, the Contractor shall clean up and remove all refuse and unused materials of any kind resulting from the Project. If the Contractor fails to commence the cleanup within 24 hours after being directed to do so by the Project Manager, the Project Manager may have the cleanup performed by others. The cost shall be borne by the Contractor and may be deducted from payments due or to become due the Contractor.

4.12.2 After the Project is completed and before final acceptance of the Project, all areas affected by the Project shall be neatly finished and all equipment, temporary structures, rubbish and waste shall be removed from the Project area.

4.13 Guarantee.

4.13.1 The Contractor shall fully warrant all work for at least one (1) full calendar year from the City’s Final Acceptance of the Project, regardless of the length of manufacturers’ or installers’ warranties.

4.13.2 In addition to any other warranties that are required, the Contractor shall make all necessary repairs and replacements to remedy any and all defects, breaks or failures of the work occurring within one (1) calendar year following the date of the City’s Final Acceptance due to faulty or inadequate materials or workmanship. Such repairs and replacements must conform to the Contract Specifications under which the Contractor originally performed the work.

4.13.3 In the event of a dispute regarding any portion of the work, the Contractor shall nonetheless provide any warranty service, repairs or replacements as described in Paragraphs 4.13.1 and 4.13.2 above, for that portion of the work that is not in dispute. In the event a dispute delays the City’s Final Acceptance of the work, the warranty for portions of the work not in dispute runs from the date of the City’s Final Acceptance of the remaining portions of the work.

4.13.4 The Contractor shall also repair any damage or remedy any disturbance to other publicly owned property or improvements thereon if caused by the Contractor’s work and if the damage or remedy occurs during the warranty period.

4.13.5 If the Contractor performs warranty work, then the warranty work for repetitive defects in materials, workmanship or equipment also shall have a one (1) calendar year warranty period from the date of its completion and the City’s Final Acceptance of that work. The Contractor shall continue to provide warranty work pursuant to the terms of the Contract until the defects are completed and the City provides notice of its Final Acceptance of the work.

4.13.6 The City shall provide the Contractor with written notice of the need to perform warranty work unless it is determined that an emergency exists, that
delay would cause serious additional loss or damage, or if any delay in performing the work might cause injury to any member of the public. If the Contractor, after written Notice, fails within ten (10) calendar days to comply with the City's request, the City has the right to perform the warranty work either by hiring another Contractor or by using its own forces. In either event, the Contractor and its Surety remain liable to the City for the cost of the work performed and any additional damage suffered by the City.

4.13.7 The Contractor shall provide a bond during the one (1) calendar year warranty period to guarantee the Contractor’s performance of warranty work. The Contractor shall provide to the City a bond in the amount of 20% of the final Contract Amount in one of the following ways:

4.13.7.1 Continuance of the Contract performance and payment bond.

4.13.7.2 Any new performance and payment bond, acceptable to the City, which covers the Contractor’s warranty obligations imposed by the Contract Documents.

4.13.7.3 Cash deposit to the City Finance Department. A receipt from the City Finance Director constitutes proof of the deposit.

4.13.7.4 Other arrangements proposed by the Contractor that the City finds acceptable in the City's sole discretion.

5. INSURANCE, LEGAL AND FINANCIAL RESPONSIBILITY, AND PUBLIC SAFETY

5.1 Insurance.

5.1.1 Policy Requirements. The insurance policies specified herein shall be approved as to form by the City. Contractor shall deliver a certificate of all required policies to City upon execution of the Contract Documents and prior to commencement of any work under the Contract. If requested by the City, Contractor shall furnish the City with executed copies of such policies of insurance. Coverage provided by the Contractor must be underwritten by an insurance company deemed acceptable to the City. Insurance coverage shall be provided by companies admitted to do business in Oregon and rated A- or better by AM Best. A thirty (30) day notice of cancellation, termination or non-renewal in coverage clause shall be included in all insurance policies. Failure to maintain any required insurance coverage in the minimum required amount shall constitute a material breach of the Contract and shall be grounds for immediate termination of the Contract. If the insurer is unwilling or unable to provide such commitment, the Contractor shall provide the City with the relevant sections of its policies describing how the insurer may reduce, modify or cancel the insurance. Furthermore, the Contractor has an affirmative duty to provide the City with any notice the Contractor receives regarding the reduction, modification or
cancellation of its insurance within 24 hours of Contractor’s receipt of such notice. All policies required by these provisions shall:

5.1.1.1 also name the City as an additional insured, protecting City from any and all claims, losses, actions or omissions of Contractor or as a result of the joint concurring or contributory act, omission or negligence of Contractor and City arising with or related to activities specified under the Contract;

5.1.1.2 be written as primary policies, not contributing with, or in excess of, any coverage City may have; and

5.1.1.3 have loss payable clauses in favor of and reasonably satisfactory to City.

5.1.2 Commercial General Liability Insurance. During the performance of the Contract, Contractor shall obtain and maintain continuously in effect a commercial general liability insurance policy, including personal and advertising injury liability and products, completed operations and construction site coverage, with a combined single limit per occurrence of not less than $2,000,000. The aggregate limit shall not be less than $4,000,000. The policy shall be endorsed to state that the aggregate limit of liability shall apply separately to the Contract. Coverage may be written in combination with Commercial Automobile Liability Insurance with separate limits for Commercial General Liability and Commercial Automobile Liability. If available, such policy shall contain a contractual liability endorsement to cover Contractor’s indemnification obligations under the Contract. Claims Made policies will not be accepted.

5.1.3 Commercial Automobile Liability Insurance. At all times during the term of the Contract, and at the sole expense of Contractor, Contractor shall maintain continuously in effect, “Symbol 1” commercial automobile liability coverage covering all owned, non-owned and hired vehicles. This coverage may be written in combination with the Commercial General Liability Insurance with separate limits for Commercial Automobile Liability and Commercial General Liability. Combined single limit per occurrence shall not be less than $2,000,000. If this coverage is written in combination with the Commercial General Liability, the aggregate limit for Commercial General Liability shall not be less than $4,000,000 and the policy shall be endorsed to state that the aggregate limit of Commercial General Liability shall apply separately to the Contract.

5.1.4 Workers Compensation. At all times during the term of the Contract, and at the sole expense of the Contractor and Subcontractors, the Contractor and all Subcontractors shall comply with ORS 656.017, which requires them to provide Workers Compensation coverage for all their subject workers.

5.1.5 Pollution Liability. Contractor or appropriate Subcontractor shall obtain, at their expense, and keep in effect during the term of the Contract, Pollution Liability Insurance covering their liability for bodily injury, property damage and
environmental damage resulting from sudden accidental or gradual pollution and related cleanup costs incurred by the Contractor or appropriate Subcontractor, all arising out of the work or services (including the transportation risk, when applicable) to be performed under the Contract. Combined single limit per occurrence shall not be less than $2,000,000, with an annual aggregate limit of not less than $4,000,000. If available, such policy shall contain a contractual liability endorsement to cover Contractor’s indemnification obligations under the Contract. Claims Made policies will not be accepted.

5.2 Indemnification. The Contractor shall hold the City harmless from, and indemnify it for, all loss, costs, claims, demands, damages, suits, actions and judgments for property damage and/or personal injury, including death, arising out of the Project or performance under the Contract by the Contractor’s agents or employees, or any of them. In any event any such action or claim is brought against City, Contractor shall, if City so elects, upon tender by City, defend the same at Contractor’s sole cost and expense, promptly satisfy any judgment adverse to City or to City and Contractor jointly and reimburse City for any loss, costs, damage or expense (including legal fees) suffered or incurred by City.

5.3 Taxes and Charges. The Contractor shall pay state and local sales and use taxes on all items as required by the laws and statutes of the state and its political subdivisions. The Contractor shall withhold and pay any and all withholding taxes, whether state or federal; pay all social security charges and state unemployment compensation charges; and pay or cause to be withheld, as the case may be, any and all taxes, charges, fees or sums whatsoever which are now or may hereafter be required to be paid or withheld under the laws.

5.4 Bid Bond, Payment Bond, Performance Bond and Public Works Bond.

5.4.1 Contracts for Under $25,000.00. Except when required by the Purchasing Agent, and except for public improvement contracts, bids on all public contracts under twenty-five thousand dollars ($25,000.00) are exempt from the requirements for a Bid Bond, a Performance Bond to assure performance of the Contract and a Payment Bond to assure payment of the obligations incurred in the performance of the Contract. The Information for Bidders shall state when Bonds are required for contracts under $25,000.00.

5.4.2 Contracts for $25,000.00 or More. Except for public improvement contracts, or except when waived by the Council, bids on all public contracts of twenty-five thousand dollars ($25,000.00) or more, shall be accompanied by a Bid Bond, and the Contractor shall post a Performance Bond to assure performance of the Contract and a Payment Bond to assure payment of the obligations incurred in the performance of the Contract. The Information for Bidders shall state when the requirement for Bonds have been waived for contracts of $25,000.00 or more.

5.4.3 Public Improvement Contracts & Contracts for Highways, Bridges and Other Transportation Projects:
5.4.3.1 Bids on Public Improvement contracts for one hundred thousand dollars ($100,000.00) or less, and contracts for highways, bridges and other transportation projects for fifty thousand dollars ($50,000.00) or less, are exempt from the requirement of a Bid Bond, a Performance Bond and a Payment Bond.

5.4.3.2 Bids on Public Improvement contracts for more than one hundred thousand dollars ($100,000), and contracts for highways, bridges and other transportation projects for more than fifty thousand dollars ($50,000), must be accompanied by a Bid Bond, Performance Bond and Payment Bond.

5.4.4 Emergency Contracts. For all contracts awarded under Roseburg Municipal Code Subsection 3.06.025(F), the City Council or the Purchasing Agent may waive the requirements for Bid Bond, the Payment Bond and the Performance Bond. Upon receiving the Purchasing Agent’s report regarding the emergency conditions necessitating waiver, as required by Roseburg Municipal Code Subsection 3.06.025(F), the Council may modify or reject the Purchasing Agent’s decision to waive Bond requirements.

5.4.5 Public Works Bond. Before beginning work on a public works contract, a contractor or subcontractor, unless exempt under ORS 279C.800 to 279C.870, shall submit a $30,000 Public Works Bond to the Construction Contractors Board and certify to the City that such Bond has been submitted. In case of an emergency, or when the City’s interest or property would probably suffer material injury by delay or other cause, the requirement to file a Public Works Bond may be excused if the Purchasing Agent has declared an emergency under Roseburg Municipal Code Section 3.06.025.

5.4.6 Submittal and Return of Bid Bonds. When required by the above Subparagraphs, the Bid Bond shall accompany the bid in the form of cash, certified check, cashier’s check, irrevocable letter of credit or Bid Bond in a form approved by City, and in an amount equal to ten percent (10%) of the total amount of the bid. There shall be no exceptions to this provision. All required Bid Bonds, excepting that of the Contractor submitting the successful bid, will be returned within thirty (30) calendar days after the Contract has been awarded. The Bid Bond from the successful Contractor will be retained until bidder has entered into a satisfactory Contract with the City, and when required, furnished a Performance Bond to assure performance of the Contract, a Payment Bond to assure payment of the obligations incurred in the performance of the Contract and the Public Works Bond Confirmation form executed by the Contractor. Should the successful bidder fail or refuse to execute the Contract and/or furnish the Payment Bond, Performance Bond or Public Works Bond Confirmation form as required, the Bid Bond deposited by said bidder shall be retained as liquidated damages by the City.

5.4.7 Bond Form. The form of all bonds required by the City shall be as the City may prescribe, and shall be with a Surety company satisfactory to the City.
and authorized to do business in the State of Oregon. Bonds shall be in force for one year after acceptance of the completed Project to cover all guarantees against defective materials and workmanship and all claims by subcontractors or third parties for services or materials provided to Contractor or Contractor's Subcontractors.

5.5 **Royalties and Patents.** The Contractor shall pay all royalty and license fees, unless otherwise specified. The Contractor shall defend all suits or claims for infringement of any patent rights and shall save the City and the Project Manager harmless from loss on account thereof.

5.6 **Permits and Licenses.**

5.6.1 The Contractor shall apply for and obtain, but the City shall cover the cost of, all rights-of-way permits, easements, franchises, highway crossing permits and railroad crossing permits as required. The Contractor shall comply with all specifications or requirements stipulated in the permits granted to the City.

5.6.2 The Contractor shall obtain at Contractor's expense, all other permits (such as building permits, burning permits, blasting permits and safety permits), licenses and inspection fees necessary for construction purposes as required by appropriate local, county, state or federal laws and/or ordinances. The Contractor shall also be registered to do business with the City of Roseburg prior to beginning work on the Contract.

5.7 **Laws to be Observed.** The Contractor shall keep fully informed of all local and county ordinances, state and federal laws in any manner affecting the Project herein specified. Contractor shall at all times comply with said ordinances, laws and regulations, and the City's Standard Contract Provisions in Exhibit “A” of the Construction Contract; and protect and indemnify the City and City's officers and agents against any claim or liability arising from or based on the violation of any such laws, ordinances, provisions or regulations.

5.8 **Safety.**

5.8.1 The Contractor will be solely and completely responsible for conditions of the jobsites, including safety of all persons and property during work on the Project. This requirement will apply continuously and not be limited to normal working hours. Safety provisions shall conform to all applicable federal, state, county and local laws, ordinances and codes. The Contractor shall comply with ORS 279C.505(2) drug testing program requirements at all times throughout the completion of the Project.

5.8.2 The Contractor shall also comply with the "U.S. Department of Labor Occupational Safety and Health Act", the "Construction Safety Act" administered by the U.S. Department of Labor, and the "Manual of Accident Prevention in Construction" published by the Associated General Contractors of America, except where these are in conflict with state laws, in which case the more stringent requirement must be followed.
5.8.3 Contractor shall comply with all federal, state and local safety requirements, including but not limited to regulations pertaining to health hazard notification, control of hazardous energy, use of hazardous substances, handling and disposal of hazardous waste, removal and disposal of asbestos, entry into and work in confined spaces and handling of materials containing lead. City will notify Contractor of any hazardous conditions of which City is aware and will provide Contractor with information about City's safety and hazard notification programs. Such notification from the City does not relieve Contractor of any responsibility under the Contract or under federal or state statute, regulation or common law to inform itself of existing and potential hazards, to communicate those hazards to its employees, and to use all reasonable steps to minimize the risk of harm to its employees, other workers and the public.

5.8.4 The Contractor shall maintain at the jobsite all articles necessary for giving first aid to the injured and shall establish the procedure for the immediate removal to a hospital or a doctor's care of persons (including employees) who may be injured on the jobsite.

5.8.5 The duty of the Project Manager to conduct construction review of the Contractor's performance is not intended to include review of the adequacy of the Contractor's safety measures in, on or near the construction sites.

5.8.6 If death, serious injuries or serious damages are caused, the accident shall be reported immediately by telephone or messenger to both the Project Manager and the City. In addition, the Contractor must promptly report in writing to the Project Manager all accidents whatsoever arising out of, or in connection with, work on the Project or adjacent to the sites, giving full details and statements of witnesses.

5.8.7 If any claim is made by anyone against the Contractor or any Subcontractor because of any accident, the Contractor shall promptly report the facts in writing to the Project Manager, giving full details of the claim.

5.9 **Equal Opportunity Clause.** The provisions of Executive Order 11246 of September 24, 1965, and the Rules and Regulations issued therein are hereby incorporated by reference, and the Contractor agrees, by acceptance of the Contract, to comply with such Executive Order, rules, regulations and amendments thereto, to the extent the same are applicable to the contracting and/or subcontracting of services or work hereunder.

5.10 **Warning Signs and Barricades.** The Contractor shall provide adequate signs, barricades and lights and take all necessary precautions for the protection of the work under the Project and the safety of the public. All barricades and obstructions shall be protected at night by signal lights which shall be kept burning from sunset to sunrise. Barricades shall be of substantial construction and shall be painted white or whitewashed to increase their visibility at night. Suitable warning signs shall be so placed and illuminated at night as to show in advance where construction, barricades or detours exist.
5.11 **Flaggers.** In addition to furnishing and maintaining adequate signs, barricades and lights, the Contractor is required to furnish any and all flaggers that are required to control traffic. The City is hereby specifically exempted from furnishing any flaggers for the Project. If flaggers are required on any jobsite, they shall be supplied by the Contractor at no additional cost to the City.

5.12 **Public Safety and Convenience.** The Contractor shall at all times conduct work on the Project so as to insure the least possible obstruction to traffic and inconvenience to the general public and residents in the vicinity of the Project, and to insure the protection of persons and property in a manner satisfactory to the Project Manager. No road or street shall be closed to the public except with the permission of the Project Manager and proper governmental authority. Temporary provisions shall be made by the Contractor to insure the use of sidewalks and the proper functioning of all gutters, sewer inlets, drainage ditches and irrigation ditches, which shall not be obstructed except as approved by the Project Manager.

5.13 **Protection of Work and City's Property.** The Contractor shall at all times safely guard the City's property and equipment from injury or loss in connection with Contractor's work under the Contract. The Contractor shall at all times safely guard and protect the Project and adjacent property (as provided by law and the Contract Documents) from damage. Contractor shall be responsible for any damage to the City's property and equipment which is a result of the Contractor's negligence.

5.14 **Sanitary Provisions.** The Contractor shall provide and maintain such sanitary accommodations for the use of its employees and those of its subcontractors as may be necessary to comply with the requirements and regulations of the local and state departments of health and as directed by the Project Manager.

5.15 **Payment of Prevailing Wages on Public Works in Oregon.**

5.15.1 The Contractor and all Subcontractors on the Project shall pay not less than the "prevailing rate of wage" as that term is defined in ORS 279C.800 to 279C.870, and if applicable, the Federal Prevailing Wage required under the Davis-Bacon Act (40 U.S.C. 3141 - 3148), whichever is higher. The determination and application of such prevailing rate of wage is provided for in ORS 279C.800 through 279C.870, and if applicable, the Davis-Bacon Act (40 U.S.C. 3141 - 3148).

5.15.2 If the Bureau of Labor has made no determination of the prevailing rate of wage, it shall be the obligation of the Contractor to determine the same by making application to the Bureau of Labor or otherwise.

5.15.3 The Contractor or the Contractor's surety and every Subcontractor or the Subcontractor's surety shall file certified statements with the City in writing using the form prescribed by the Commissioner of the Bureau of Labor and Industries certifying the hourly rate of wage paid each worker whom the Contractor or the Subcontractor has employed in the work under this Contract and further certifying that no worker employed upon such public work has been paid less than the
prevailing rate of wage or less than the minimum hourly rate of wage specified in this Contract. The certified statement shall be verified by the oath of the Contractor or the Contractor’s surety or Subcontractor or the Subcontractor’s surety that the Contractor or Subcontractor has read the certified statement and knows the contents thereof and that the same is true to the Contractor’s or Subcontractor’s knowledge. The certified statements shall set out accurately and completely the payroll records for the prior week including the name and address of each worker, the worker’s correct classification, rate of pay, daily and weekly number of hours worked, deductions made, and actual wages paid.

5.15.4 Each certified statement shall be delivered or mailed by the Contractor or Subcontractor to the City. A true copy of the certified statement shall also be filed at the same time with the Commissioner of the Bureau of Labor and Industries. Certified statements for each week during which the Contractor or Subcontractor employs a worker upon the public work shall be submitted once a month, by the fifth business day of the following month. Information submitted on certified statements may be used only to ensure compliance with the provisions of ORS 279C.800 to 279C.870 or the Davis-Bacon Act (40 U.S.C. 3141 - 3148), whichever applies.

5.15.5 As provided by ORS 279C.810, the contract amount threshold for application of the state prevailing wage rate law is $50,000.00.

5.16 Subcontractor and Supplier Agreements. The Contractor shall include in its subcontracts for property or services entered into by the Contractor and a first-tier subcontractor, including a material supplier, for the purpose of performing the Contract:

5.16.1 A payment clause that obligates the Contractor to pay the first-tier subcontractor for satisfactory performance under its subcontract within ten (10) calendar days of payment by the City out of such amounts as are paid to the Contractor by the City under the Contract; and

5.16.2 An interest penalty clause that obligates the Contractor, if payment is not made within thirty (30) calendar days after receipt of payment from the City, to pay to the first-tier subcontractor, an interest penalty on amounts due in the case of each payment not made in accordance with the payment clause included in the subcontract pursuant to this requirement. The Contractor or first-tier subcontractor shall not be obligated to pay an interest penalty if the only reason that the Contractor or first-tier subcontractor did not make payment when payment was due, is that the Contractor or first-tier subcontractor did not receive payment from the City or Contractor when payment was due. The interest penalty shall be:

5.16.2.1 For the period beginning on the day after the required payment date and ending on the date on which payment of the amount is made; and

5.16.2.2 Computed at the rate specified in ORS 279C.515(2).
5.16.3 The Contractor shall include in each of its subcontracts, for the purpose of performance of the Contract condition, a provision requiring the first-tier subcontractor to include a payment clause and an interest penalty clause conforming to the standards set forth in this section and requiring each of its subcontractors to include such clauses in their subcontracts with lower-tier subcontractors or suppliers.

5.16.4 None of the provisions of this section are intended to prevent the Contractor or any subcontractor from including in its contracts, the provision described in ORS 279C.580 (5) and (6).

5.17 Application for and Processing of Subcontractor and Supplier Payments. The Contractor shall provide each first-tier Subcontractor, including a material supplier, with a standard form that the first-tier Subcontractor may use as an application for payment or as another method by which the Subcontractor may claim a payment due from the Contractor. The Contractor, except as otherwise provided in this Subsection, shall use the same form and regular administrative procedures for processing payments during the entire term of the subcontract. The Contractor may change the form or the regular administrative procedures the Contractor uses for processing payment if the Contractor:

5.17.1 Notifies the Subcontractor in writing at least forty-five (45) calendar days before the date on which the Contractor makes the change; and

5.17.2 Includes with the written notice a copy of the new or changed form or a description of the new or changed procedure.

6. PROGRESS AND COMPLETION OF PROJECT

6.1 Contract Time and Commencement of Construction. The Contractor shall be capable of commencing construction on the Project covered under the Contract within ten (10) calendar days after signing of the Construction Contract. The Contract shall be in effect from the time it is signed until the Project is complete and accepted by the City. During periods when weather or other conditions are unfavorable for construction, the Contractor shall pursue only such portions of the work that will not be damaged thereby. Contractor shall not construct any portion of the work during the time unfavorable conditions exist that are likely to adversely affect the quality or efficiency of the work. It is expressly understood and agreed by and between the Contractor and the City that the Contract time specified for completion of the work described herein is a reasonable time, taking into consideration the average climatic and economic conditions and other factors prevailing in the locality of the work.

6.2 Preconstruction Conference. A preconstruction conference will be scheduled by the City prior to commencement of construction. The Contractor will be notified of the time and place of this conference and shall be required to attend. Ten (10) calendar days prior to the preconstruction conference, the Contractor shall provide to the Project Manager four (4) copies of a project work schedule for review and approval. The Contractor has an affirmative duty to update the construction schedule each time changes occur.


6.3 Prosecution of the Project.

6.3.1 It is expressly understood and agreed that the time of beginning, rate of progress and time of completion of the Project are of the essence of the Contract. The Contractor shall perform the construction of said Project with due diligence and at such a rate and in such a manner as, in the opinion of the Project Manager, is necessary for completion within the time set forth in Paragraph 4 of the Contract.

6.3.2 After commencement of construction on the Project by the Contractor, if the Contractor is delayed by reason of the failure of the City to provide sufficient materials for construction thereof or to provide continuous open right-of-way, then the completion date of said Project shall be extended to the extent that the Contractor is delayed in carrying on said Project by reason of such failure on the part of the City.

6.3.3 The Contractor shall arrange its work and dispose of materials so as to insure the least possible interference and inconvenience to the landowners on or beside whose property the construction is taking place, or to the public where the construction lies in or near a public thoroughfare. Contractor shall employ only such number of construction crews as are reasonably necessary to construct said Project within the allotted time. The City may require the employment of an additional crew or crews, if in its judgment it is necessary in order to complete said Project with the time required.

6.3.4 If the Contractor desires to carry on work at night or outside the regular hours, timely notice shall be given to the Project Manager to allow satisfactory arrangements to be made for inspecting the Project in progress.

6.4 Provisions for Delays:

6.4.1 Notice of Delays. Whenever the Contractor foresees any delay in the prosecution of the work, and in any event, immediately upon the occurrence of any delay which the Contractor regards as unavoidable, Contractor shall notify the Project Manager in writing on the probability of the occurrence of such delays, the probable duration and cause. The Contractor shall take immediate steps to prevent the occurrence or continuance of the delay. If this cannot be done, the Project Manager shall determine how long the delay will probably continue and to what extent the prosecution and completion of the work are being delayed thereby. The Project Manager shall also determine whether the delay is to be considered avoidable or unavoidable and shall notify the Contractor of his/her determination. The Contractor shall not make a claim for delays that are not called to the attention of the Project Manager at the time of their occurrence.

6.4.2 Avoidable Delays Defined. Avoidable delays in the prosecution or completion of the work include, but are not limited to:
6.4.2.1 All delays that could have been avoided by the exercise of care, prudence, foresight and diligence on the part of the Contractor or its Subcontractor;

6.4.2.2 Delays that do not necessarily prevent or delay the prosecution of other parts of the work or the completion of the whole work within the time specified;

6.4.2.3 Reasonable delays resulting from time required by the City and Project Manager for approval of plans submitted by the Contractor and for the making of surveys, measurements, testing and inspections; and

6.4.2.4 Delays arising from interruptions occurring in the prosecution of the work on account of the reasonable interference from other contractors employed by the City which do not necessarily prevent the completion of the whole work within the time specified.

6.4.3 Unavoidable Delays Defined. Unavoidable delays in the prosecution or completion of the work include, but are not limited to, all delays (other than avoidable delays as defined above) that result from causes beyond the control of the Contractor and that could not have been avoided by the exercise of care, prudence, foresight and diligence on the part of the Contractor or its Subcontractors. Delays caused by other contractors employed by the City will be considered unavoidable delays only insofar as they interfere with the Contractor’s completion of the work. Delays due to normal weather condition are not regarded as unavoidable delays insofar as they interfere with the Contractor’s completion of the work. If the Project Manager determines the Contractor has experienced an unavoidable delay, and further that such delay has affected the controlling operations of the work, the City shall grant to the Contractor an extension of time for Contract performance, not to exceed the number of calendar days of unavoidable delay experienced by the Contractor. The Contractor has no remedy for unavoidable delay except as provided by this paragraph. Delays due to normal weather conditions are not regarded as unavoidable as the Contractor agrees to plan its work with prudent allowances for interference by normal weather conditions. Delays caused by acts of God, fire, unusual storms, flood, earthquakes, epidemics, quarantine restrictions, strikes, labor disputes and freight embargoes are considered unavoidable delays insofar as they interfere with the Contractor’s completion of the work. Delays caused by shortages of materials are considered unavoidable providing the Contractor can prove to the City that the Contractor has made reasonable and timely attempts to secure the material(s).

A rainstorm, windstorm, high water or other natural phenomenon for the specific locality of the work, which might reasonably have been anticipated from historical records of the general locality of the work, do not constitute unusually severe weather. For the purposes of this Contract, rainfall data is assumed to be the same as that measured at the Roseburg Regional Airport by the Environmental
6.4.4 Time Extension for Delays.

6.4.4.1 Extensions for Avoidable Delays. In case the work is not completed in the time specified, including extensions of time as may have been granted for unavoidable delays, the Contractor will be assessed damages for those costs incurred by the City that are attributable to the fact the work was not completed on schedule. The City may grant an extension of time for avoidable delay if the City deems it in its best interest. The Contractor shall compensate the City, in exchange for granting an extension of time for avoidable delay, for the actual costs to the City of Project management, inspection, general supervision and overhead expenses which are directly chargeable to the work and that accrue during the period of such extension. The actual costs do not include charges for final inspection and preparation of the final estimate by the City.

6.4.4.2 Extensions for Unavoidable Delays. For delays the Contractor considers unavoidable, the Contractor shall submit to the Project Manager, complete information demonstrating the effect of the delay on the controlling operation in its construction schedule. The submission must be made within ten (10) calendar days of the beginning of the occurrence which is claimed to be responsible for the unavoidable delay. The Project Manager shall review the Contractor’s submittal and determine the number of calendar days of unavoidable delay, if any, and the effect of such delay on the controlling operations of the work. If the Project Manager determines the Contractor has experienced an unavoidable delay, and further that such delay has affected the controlling operations of the work, the City shall grant to the Contractor an extension of time for Contract performance, not to exceed the number of calendar days of unavoidable delay experienced by the Contractor. The Contractor has no remedy for the unavoidable delay except as provided in this Section. During such extension of time, neither charges for the inspection nor administration nor damages for delay will be assessed against the Contractor. It is understood and agreed by the Contractor and the City that time extensions due to unavoidable delays involve controlling operations that would prevent completion of the whole work within the specified time.

If the Contractor disagrees with the Project Manager’s determination, the Contractor may appeal such
determination to the City Manager in accordance with Paragraph 3.4.2.

6.5 **Changes in the Project.** The City may, as the need arises, order changes in the Project through additions, deletions or modifications without invalidating the Contract. Compensation and time of completion affected by the change shall be adjusted at the time of ordering such change.

6.6 **Extra Work.** New and unforeseen items of work found to be necessary but which cannot be covered by any item or combination of items for which there is an established Contract price, shall be classified as extra work. Upon written order from the City and approval from the Project Manager, the Contractor shall do such extra work as may be required for the proper completion or construction of the whole Project contemplated. In the absence of such written order, no claim for extra work shall be considered. Extra work shall be performed in accordance with these Specifications where applicable and work not covered by the Specifications or special provisions shall be done in accordance with the best practice as approved by the Project Manager. Extra work required in an emergency to protect life and property shall be performed by the Contractor as required. Contractor shall notify the Project Manager of the emergency as soon as possible, but shall begin work prior to providing notice if immediate work is necessary to protect life or property.

6.7 **Unforeseen Difficulties.** A delay beyond the Contractor's control occasioned by an act of God, or by strikes, lockouts, fire, etc., may entitle the Contractor to an extension of time to complete the Project as determined by the Project Manager, provided however, that the Contractor shall immediately give written notice to the Project Manager of the cause of such delay. In no event shall the Contractor be entitled under the Contract to collect or recover any damages, loss or expense incurred by any delay other than as caused by the City as stipulated hereinabove in Subsection 6.3 "Prosecution of the Project".

6.8 **Use of Completed Portions.** The City shall have the right to take possession of and use any completed or partially completed portions of the Project. Such use shall not be considered as final acceptance of any portion of the Project, nor shall such use be considered as cause for an extension of Contract completion time unless authorized by a change order issued by the City.

6.9 **Liquidated Damages.** If the Contractor fails to complete the work, or any part thereof, in the time agreed upon in the Contract or within such extra time as may have been allowed for delays by extensions granted as provided in the Contract, the Contractor shall reimburse the City for the additional expense and damage for each calendar day that the Contract remains uncompleted after the Contract completion date. It is agreed that the amount of such additional expense and damage incurred by reason of failure to complete the Contract is the per diem rate as stipulated in the Bid. The amounts are hereby agreed upon as liquidated damages for the loss to the City.

It is expressly understood and agreed that this amount is not to be considered in the nature of a penalty but as damages for delay which have accrued against the Contractor. The exact amount of damage that would be sustained by the City due to delay is difficult,
if not impossible, to accurately ascertain, but the parties believe the specified amount of liquidated damages to be a reasonable forecast of the damage for delay that the City would likely sustain. Such liquidated damages are in addition to any other ascertainable damage, other than for delays that the City sustains for Contractor's breach of the Contract. The City may deduct such damages from any amount due, or that may become due the Contractor or the amount of such damages becomes due and may be collected from the Contractor of its Surety.

6.10 **Substantial Completion.** Substantial Completion shall have the meaning set forth in Subsection 1.1 “Definitions” of these General Conditions.

Upon consideration by the Contractor that a determination of Substantial Completion of the Project, or a designated portion thereof, is completed, the Contractor shall so notify the Project Manager in writing. This notice shall include the Contractor's list of any minor incomplete contract work items to finish the Project. Upon receipt of the written notification, the Project Manager will promptly, by personal inspection, determine the actual status of the work in accordance with the terms of the Contract. If the Project Manager finds that the terms of Substantial Completion of the Contract have not yet been met, the Project Manager will so inform the Contractor. If, instead, the Project Manager determines from the inspection that the work, or the designated portion thereof, has met the terms of Substantial Completion, the Project Manager will issue to the Contractor a “Written Notice of Substantial Completion” along with a Punch List of any deficient work items needing repair or correction. The Contractor agrees to complete all such corrective work within thirty (30) calendar days after submission of the Punch List to the Contractor by the Project Manager. If the Contractor fails to complete the corrective work within the thirty (30) calendar days, the Contractor is liable to the City in the amount stated in the liquidated damages section of the Contract for each day thereafter until all corrective work is completed. The City shall be entitled to deduct liquidated damages from final payment.

6.11 **Final Completion.** The Contractor shall notify the Project Manager in writing requesting a designation of Final Completion at the completion of the punch list items related to the Substantial Completion designation, and at the completion of any other items necessary to the completion of the Project. The Project Manager will inspect these remaining items, and upon satisfactory completion, will issue a written “Notice of Final Completion” which shall be subject to the City’s Final Acceptance. In the event some items are not ready for the City’s Final Acceptance the City may, without waiving any of the City’s right to the portion(s) of the Project not yet receiving Final Acceptance, nonetheless provide Final Acceptance for those portion(s) of the items of the Project the City deems appropriate. As stated in Subsection 4.13, the terms of the guarantee commence on the date of the City’s Written Notice of Final Acceptance for that portion of the work.

7. **MEASUREMENT AND PAYMENT**

7.1 **General.**

7.1.1 All work acceptably completed under the Contract shall be measured by the Project Manager according to United States Standard Measures, and the
quantities of work performed or materials furnished shall be computed on the basis of such measurements.

7.1.2 The Contractor shall accept the compensation as herein provided in full payment for furnishing all materials not provided by the City and all labor, tools and equipment; for performing all work under the Contract; for all loss or damage arising from the nature of the Project other than unforeseeable environmental conditions as described in ORS 279C.525, the action of the elements or any unforeseen difficulties which may be encountered during the prosecution of the Project, until its final acceptance by the City.

7.2 Payments. The City shall make monthly progress payments within thirty (30) calendar days from the date of the pay request for work which has been completed and accepted by the City per ORS 279C.570.

7.3 Final Payment. The City shall retain five percent (5%) of all payments until the entire Project has been given Final Acceptance by the City. The entire Project must be accepted by the City prior to releasing retainage. Upon the City’s acceptance of the entire Project, the retainage will be released and the Contractor shall be responsible for the workmanship and materials for one year thereafter as provided in Subsection 4.13.

7.4 City’s Right to Withhold Payment. The City may withhold payment in whole or in part on an approved invoice to the extent necessary to protect City from loss due to any of the following causes discovered subsequent to approval of the invoice by the Project Manager or the Project Manager’s representative:

7.4.1 Defective work;

7.4.2 Evidence indicating the probable filing of claims by other parties against the Contractor;

7.4.3 Failure of the Contractor to make payments to Subcontractors, material suppliers or workers; or

7.4.4 Damage to another contractor.

7.5 Payment for Uncorrected Work. Should the Project Manager direct the Contractor not to correct work that has been damaged or that was not performed in accordance with the Contract Documents, the City may make an equitable deduction from the amount due to the Contractor on the Project in order to compensate the City for the uncorrected work.

7.6 Payment for Extra Work. In any case where the Contractor deems additional compensation is due Contractor for work or materials not clearly covered in the Contract Documents or not ordered by the Project Manager according to provisions of the Contract Documents, the Contractor shall notify the Project Manager, in writing, of his intention to make a claim in order that such matters may be settled, if possible, or other appropriate action promptly taken. If such notification is not given, or the Project Manager is not afforded proper facilities by the Contractor for keeping strict account of
actual cost, then the Contractor hereby waives the claim for such extra compensation. Such notice by the Contractor, and the fact that the Project Manager has kept account of the cost as aforesaid, shall not in any way be construed as proving the validity of the claim. Claims for additional compensation shall be made in itemized detail and submitted, in writing, to the City and Project Manager within ten (10) calendar days following completion of that portion of the Project for which the Contractor makes his claim. In case the claim is found to be just, it shall be allowed and paid under a supplemental agreement to be entered into between the parties to the Contract.

7.7 **Release of Liens.**

7.7.1 Before the City pays the Contractor for the work included under the Contract, the Contractor shall sign and deliver to the City a release of liens or claims sworn to under oath and duly notarized. The release shall state that the Contractor has satisfied all claims and indebtedness of every nature in any way connected with the Project, including but not limiting the generality of the foregoing, all payrolls, amounts due to subcontractors, accounts for labor performed and materials furnished, incidental services, liens and judgments.

7.7.2 If any lien or claim remains unsatisfied after payment to the Contractor is made, the Contractor shall refund to the City all monies that the City may be compelled to pay in discharging such a lien or claim, including all costs and reasonable attorneys’ fees.

7.8 **Acceptance of Payment Constitutes Release.** The acceptance by the Contractor of a payment for the invoice shall release the City from all claims and liability to the Contractor for all things done or furnished in connection with the work specified on said invoice, and every act of the City and others relating to or arising out of the Project. No payment, however, final or otherwise, shall operate to release the Contractor or his Sureties from obligations under the Contract, the Performance Bond or the Payment Bond as herein provided.

7.9 **Correction of Defective Work.** The Project Manager’s approval of the invoice for work completed and the City’s payment to the Contractor on such invoice, shall not relieve the Contractor of the responsibility for faulty materials or workmanship on said work during the one-year guarantee period as stipulated in Subsection 4.13. The one-year guarantee period for each portion of the Project begins when each portion of the Project receives written notice of Final Acceptance from the City. The City shall promptly give notice of faulty materials or workmanship which are discovered within the one-year guarantee period and the Contractor shall promptly replace any such defects. If the Contractor fails to make the repairs and replacements promptly, the City may do the work, and the Contractor and Contractor’s Surety shall be liable for the cost thereof.

8. **ENVIRONMENTAL MATTERS**

8.1 **Contractor Compliance.** Contractor shall comply with, and require its Subcontractors to comply with, all applicable federal, state and local statues, ordinances, orders, rules and regulations relating to the protection of human health and environment, including
but not limited to, the use, storage, release, spill, disposal or other handling of petroleum products and other hazardous substances.

8.2. Unanticipated Regulatory Compliance and Site Conditions.

8.2.1 If Contractor is delayed or additional work is required due to the enactment of new or an amendment to existing statutes, ordinances or regulations relating to the prevention of environmental pollution and the preservation of natural resources occurring after submission of the successful bid, City may, at its sole discretion:

8.2.1.1 terminate the Contract;
8.2.1.2 complete the Project itself;
8.2.1.3 use non-City forces already under contract with the City;
8.2.1.4 require that the underlying property owner be responsible for the additional work;
8.2.1.5 call for bids for a new contractor to provide the necessary services; or
8.2.1.6 issue Contractor a change order setting forth the additional work that must be undertaken.

8.2.2 If Contractor encounters a condition not referred to in the Contract Documents, not caused by Contractor and not discoverable by a reasonable pre-bid visual site inspection, and such condition requires compliance with the regulations referred to in Paragraph 8.2.1 above, Contractor shall immediately provide City notice of the condition. Except as required by any environmental or natural resource regulation, or, in case of an emergency, Contractor shall not commence work or incur any additional job site costs with regard to the condition encountered without written direction from the City. Upon request, Contractor shall estimate emergency or regulatory compliance costs as well as the anticipated delay and costs resulting from the encountered condition, and promptly deliver such estimate to City for resolution.

8.2.3 In the event of an occurrence of an unanticipated site condition as described in Paragraph 8.2.2 above, City, within a reasonable period of time, may do any of the following at its sole discretion:

8.2.3.1 terminate the Contract;
8.2.3.2 complete the Project itself;
8.2.3.3 use non-City forces already under contract with the City;
8.2.3.4 require that the underlying property owner be responsible for the additional work;

8.2.3.5 call for bids for a new contractor to provide the necessary services; or

8.2.3.6 issue Contractor a change order setting for the additional work that must be undertaken.

8.2.4 In the event City terminates the Contract under Subparagraph 8.2.1.1 or 8.2.3.1, Contractor shall be entitled to all costs and expenses incurred to the date of the termination, including overhead and reasonable profits, on the percentage of the Project completed. Contractor shall not be entitled to profits or consequential damages on the uncompleted portion of the Contract. If the City chooses to issue a change order or terminate the Contract for either of the reasons set forth in Paragraph 8.2.1 or 8.2.3, Contractor agrees to provide the City access to Contractor's documentation used to prepare Contractor's bid in order to assist City in making the City's determination of the additional compensation to be paid.

9. CHANGE ORDERS.

9.1 Authorized Changes in the Work. Changes to the drawings, specifications, quantities or details of the Project are inherent in the nature of construction and may be necessary or desirable during the course of Project construction. Without impairing or invalidating the Contract, the City may at any time, without notice to any surety, by written order designed or indicated to be a Change Order or a Proposal Request, make any change in the work within the general scope of the Contract, including, but not limited to changes:

9.1.1 In the Plans and Specifications (including drawings and designs);

9.1.2 In the time, method, or manner of performance of the work;

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

9.1.4 Directing acceleration in the performance of the work.

9.2 Unauthorized Changes in the Work. The Contractor shall not be entitled to an increase in the Contract price or an extension of the Contract times with respect to any work performed that is not required by the Contract Documents as amended, modified or supplemented except in the case of an emergency. In the event of an emergency, the Contractor has seven (7) calendar days to notify the Project Manager of the nature and extent of the emergency. If notification is not provided within seven (7) calendar days, no time adjustment or cost compensation will be allowed.

9.3 Execution of Change Orders. The City and the Contractor shall execute appropriate Change Orders and Proposal Requests and upon receipt of an approved Change Order
or Proposal Request, the Contractor shall perform the work as modified. If the Change Order increases the Contract amount, the Contractor shall notify Contractor’s Surety of the increase and shall provide the City with a copy of any resulting modification to the Bond documents. Change Order and Proposal Requests shall clearly state all costs and schedule adjustments.

9.4 **No Oral Change Orders.** No oral order, statement or conduct of the City constitutes a Change Order or entitles the Contractor to an equitable adjustment.

9.5 **Change of Contract Price.**

9.5.1 The Contract price may only be changed by a Change Order.

9.5.2 The value of any work covered by a Change Order or of any claim for an adjustment in the Contract price will be determined as follows:

9.5.2.1 Where the work involved is covered by the unit prices contained in the Contract Documents, by application of such unit prices to the quantities of the items involved; or

9.5.2.2 Where the work involved is not covered by unit prices contained in the Contract Documents, by a mutually agreed lump sum; or

9.5.2.3 Where the work involved is not covered by the unit prices contained in the Contract Documents and agreement to a lump sum is not reached under Subparagraph 9.5.2.2, time and materials basis plus the Contractor’s fee for overhead and profit as defined in Paragraph 9.5.3.

9.5.3 **Percentage Allowances.** For work negotiated and completed on a time and materials basis the Contractor’s maximum allowable percentage markup of such costs shall be as follows:

- Materials 15%
- Equipment 15%
- Labor 20%
- Special Services 15%

9.5.3.1 When a subcontractor performs work under a time and materials Change Order, the Contractor will be allowed a supplemental markup of 5% on the subcontractor’s charges.

9.6 **Lump Sum Change Orders.** Whenever practicable, changes in Contract price resulting from extra work will be determined by a mutually agreed-upon lump sum price. The Contractor’s proposal for such changes must include a detailed breakdown of all labor and materials to be performed by its forces and by the forces of its Subcontractors and material suppliers.
Costs for labor, material, rentals, approved services, and for overhead and profit for the Contractor, Subcontractor and material suppliers must be calculated as specified under the Subsection 9.7.

When the City desires a price quotation from the Contractor for a proposed change to the Contract, the Project Manager will issue a Proposal Request describing the proposed changes. The Contractor shall respond with a price quote within ten (10) calendar days of the issuance of the Proposal Request.

Contractor’s quotations for Change Orders and Proposal Requests must be in writing and firm for a period of thirty (30) calendar days. Any compensation paid in conjunction with the terms of a Change Order compromises the total compensation due the Contractor for the modification defined in the Change Order. By signing the Change Order or Proposal Request, the Contractor acknowledges that the stipulated compensation includes payment for the modification plus all payment for the interruption of schedules, extended overhead, delay or any other impact claim or ripple effect, and by such signing specifically waives any reservation or claim for additional compensation or claim for Contract time extension in respect to the subject Change Order or Proposal Request.

The City's request for quotations on modifications to the work is not considered authorization to proceed with the work prior to the approval of a formal Proposal Request or Change Order, and such request does not justify any delay in existing work.

9.7 **Time and Material Change Orders.** Whenever the Contractor is directed by written notice from the Project Manager as the City’s representative, to perform extra work on a time and material basis, the Contractor shall furnish labor, equipment and materials necessary to complete the work in a satisfactory manner and within a reasonable period of time. For the work performed, payment will be made for the documented actual necessary expense of the following:

**9.7.1** Field and office labor, including estimating and procurement personnel and foremen, who are directly assigned to the time and materials work (actual payroll cost, including wages, fringe benefits as established by law). The cost of labor includes any employer payment to or on behalf of the worker for health and welfare, pension, vacation and similar purposes. Where subsistence and travel allowances are required for performance of extra work, the charges consist of the actual amount paid to each worker. No other fixed labor burdens will be considered unless approved in writing by the City.

**9.7.2** Material delivered and used on the designated work, including sales tax, if paid by the Contractor or its Subcontractor.

**9.7.3** Rental or equivalent rental cost of equipment, including necessary transportation, for items having a value in excess of $100. When equipment is not rented, the equivalent rental cost of equipment is based on the standard rental rates for Contractor-owned equipment, but in no event exceeds the rental rates set forth in the most current edition of the “Equipment Watch Rental Rate Blue Book”, published by Penton Media. For equipment not listed in the Blue Book,
the rental rate is as listed by the local section of the Associated General Contractors. If the equipment is not listed by the Associated General Contractors, the rental rate will be mutually agreed upon in writing between the Contractor and City prior to the use of the unlisted equipment. The reasonable cost of moving equipment onto and off the job site may be included, but equipment rental will not be paid when the equipment is inoperative due to breakdowns. Individual pieces of equipment or small tools having a replacement value of $100 or less are considered as included in the overhead allowances and no additional payment therefore will be made.

When equipment is used on the extra work for less than five (5) business days, hourly rates will be used. Less than thirty (30) minutes of operation are considered ½ hour of operation. When equipment is used on the extra work for more than five (5) business days, weekly rates apply. In this case, less than four (4) hours of operation is considered to be ½ calendar day of operation.

Rental or equivalent rental cost will be allowed for only those days or hours during which the equipment is in actual use. Rental and transportation allowances must not exceed the current rental rates prevailing in the locality. The rentals allowed for equipment are understood to cover all fuel, supplies, repairs, and renewals.

The City reserves the right to furnish such materials and equipment as it deems expedient, and the Contractor has no claim for profit or added fees on the cost of such materials and equipment.

9.7.4 The added fixed fees defined in Paragraph 9.5.3 constitute full compensation for the cost of general supervision, overhead, profit and any other general expense.

9.7.5 If a dispute occurs over payment for work provided on a time and material basis, the dispute is not cause for stopping work.

9.7.6 The Contractor shall maintain accurate and detailed records for all work performed on a time and materials basis. These records must reflect all the actual necessary expenses pertaining to the extra work and must at all times be available for audit by the City.

9.7.7 The Contractor shall make clear distinction in its records between the direct costs of work paid for on a time and materials basis and the costs of other work. The Contractor shall furnish the Project Manager report sheets in duplicate of each day’s work that itemize the labor, materials and equipment used, and shall make the report sheets available for the City's review. The daily report sheet must provide names or identifications and classifications of workers, the hours worked, the sizes, types and identification numbers of equipment, and hours operated. Daily report sheets must be signed by the Contractor or its authorized agent and verified by the Project Manager.
9.7.8 To receive partial payments and final payment for time and materials work, the Contractor shall submit to the Project Manager, in a manner approved by the Project Manager, detailed and complete documented verification of the Contractor’s and any of its Subcontractor’s actual cost incurred. Material and rental charges must be substantiated by copies of vendors’ invoices. Such costs must be submitted within thirty (30) calendar days after said work has been satisfactorily competed.
TECHNICAL PROVISIONS
# Table of Contents

**Division 1 General**

- 1.10 General .................................................................................................................. 1-1
  - 1.11.01 Project Description ......................................................................................... 1-1
  - 1.11.02 Reuse of Documents ..................................................................................... 1-1
  - 1.11.03 Electronic Data ............................................................................................... 1-1
  - 1.13 Permits and Licenses ............................................................................................ 1-2
  - 1.15 Warranty ............................................................................................................... 1-2
- 1.30 Administrative ........................................................................................................ 1-2
  - 1.31 Responsibilities ...................................................................................................... 1-2
    - 1.31.1 Contractor’s Responsibility ............................................................................. 1-2
    - 1.31.1.2 Contractor Conducted Progress Meetings ..................................................... 1-3
    - 1.31.1.3 Contractor Provided Schedule and Non-working Day Approval .................. 1-4
  - 1.31.2 Owner Inspector’s Responsibility ...................................................................... 1-4
- 1.33 Submittals ................................................................................................................ 1-4
  - 1.33.1 Submittal and Shop Drawings ........................................................................... 1-4
  - 1.33.2 Substitutions ...................................................................................................... 1-6
    - 1.33.2.1 Prior to Bid Opening .................................................................................... 1-6
    - 1.33.2.2 After Contract Execution .......................................................................... 1-6
- 1.40 Quality Control ....................................................................................................... 1-7
  - 1.42 Reference Specifications ...................................................................................... 1-7
- 1.50 Construction Support .............................................................................................. 1-7
  - 1.51 Temporary Utilities ............................................................................................... 1-7
- 1.70 Execution and Closeout .......................................................................................... 1-8
  - 1.75 Testing, Startup, and Operation ............................................................................ 1-8
    - 1.75.02 Testing ........................................................................................................... 1-8
    - 1.75.03 Scheduling of Owner Review for Testing ....................................................... 1-9
    - 1.75.05 Treatment System Testing .......................................................................... 1-9
    - 1.75.30 Startup .......................................................................................................... 1-10
    - 1.75.35 Operational Demonstration ......................................................................... 1-11
  - 1.79 Training and Documentation ................................................................................ 1-11
    - 1.79.1 Training .......................................................................................................... 1-11
    - 1.79.2 Operation and Maintenance Manuals ............................................................ 1-12
# Table of Contents

1.79.3 Construction Record Drawings .................................................................................. 1-13
1.80 Performance Requirements ......................................................................................... 1-14
1.81 Seismic Restraint and Anchorage .............................................................................. 1-14
1.82 Pressure Ratings ........................................................................................................ 1-15

**Division 2 Sitework** ........................................................................................................ 2-1

2.00 General .................................................................................................................... 2-1
2.05 Common Work for Sitework ..................................................................................... 2-1
2.10 Site Preparation ......................................................................................................... 2-1
2.10.5 Construction Access ............................................................................................. 2-1
2.11 Earthwork Materials ................................................................................................. 2-2
2.11.1 Common Work for Earthwork Materials ............................................................... 2-2
2.11.2 General Fill .......................................................................................................... 2-2
2.11.4 Pipe Bedding ....................................................................................................... 2-3
2.11.5 Trench Backfill .................................................................................................... 2-3
2.11.7 Gravel Base Course ............................................................................................. 2-4
2.11.8 Gravel Top Course .............................................................................................. 2-4
2.12 Road Surfacing ........................................................................................................ 2-4
2.12.1 Common Work for Road Surfacing .................................................................... 2-4
2.12.2 Cement Concrete Pavement ............................................................................... 2-4
2.12.3 Hot Mix Asphalt (HMA) / Asphalt Concrete Pavement (ACP) ......................... 2-5

**Division 3 Concrete** ..................................................................................................... 3-1

3.00 General .................................................................................................................... 3-1
3.05 Common Work for Concrete .................................................................................... 3-1
3.06 Maintenance of Concrete ........................................................................................ 3-3
3.06.30.71 Rehabilitation of Cast-in-Place Concrete .................................................... 3-3
3.10 Forming and Accessories ....................................................................................... 3-5
3.11 Formwork ................................................................................................................ 3-5
3.11.13 Cast in Place Forming ..................................................................................... 3-5
3.15 Accessory Materials ............................................................................................... 3-6
3.15.05 Pipe Penetrations through Concrete ................................................................. 3-6
3.15.19 Concrete Anchors ............................................................................................. 3-6
3.20 Reinforcing ............................................................................................................. 3-7
# Table of Contents

3.21 Reinforcing Steel ........................................................................................................................................... 3-7
3.21.13 Reinforcing Steel ...................................................................................................................................... 3-7
3.22 Steel Welded Wire Reinforcement .................................................................................................................. 3-8
3.30 Cast-In-Place Concrete .................................................................................................................................. 3-9
3.30.01 Common Work for Cast in Place Concrete .............................................................................................. 3-9
3.31 Concrete Materials ........................................................................................................................................ 3-12
3.31.02 Structural Concrete .................................................................................................................................. 3-12
3.31.09 Controlled Density Fill (CDF) ................................................................................................................... 3-12
3.35 Surface Finishing ........................................................................................................................................ 3-13
3.35.01 Common Work for Surface Finishing ...................................................................................................... 3-13
3.35.05 Floated Finish .......................................................................................................................................... 3-13
3.60 Grouting ........................................................................................................................................................ 3-14
3.62 Non-Shrink Grout ......................................................................................................................................... 3-14

**Division 4 Masonry – This Division Not Used** ................................................................................................. 4-1

**Division 5 Fabricated Metalwork and Structural Plastics – This Division Not Used** ..................................... 5-1

**Division 6 Carpentry – This Division Not Used** .................................................................................................. 6-1

**Division 7 Thermal and Moisture Protection** ................................................................................................... 7-1

7.00 General .......................................................................................................................................................... 7-1
7.05 Common Work for Thermal and Moisture Protection .................................................................................. 7-1
7.20 Thermal Protection ........................................................................................................................................ 7-1
7.21 Thermal Insulation ....................................................................................................................................... 7-1
7.21.10 Exposed Small Piping Insulation ......................................................................................................... 7-1

**Division 8 Openings** ........................................................................................................................................ 8-1

8.00 General .......................................................................................................................................................... 8-1
8.05 Common Work for Openings .......................................................................................................................... 8-1
8.90 Louvers and Vents ....................................................................................................................................... 8-1
8.90.01 Common Work for Louvers and Vents .................................................................................................. 8-1
8.91.13 Motor Actuated Louver/Dampers: .......................................................................................................... 8-2
8.91.19 Fixed Louver .......................................................................................................................................... 8-2

**Division 9 Finishes – This Division Not Used** .................................................................................................. 9-1

**Division 10 Specialties** .................................................................................................................................. 10-1

10.00 General ........................................................................................................................................................ 10-1
# Table of Contents

10.05 Common Work for Specialties ........................................................................... 10-1

*10.10 Information Specialties ........................................................................... 10-1

10.14 Signs and Labels ......................................................................................... 10-1

10.14.1 Common Work for Signs and Labels ....................................................... 10-1

10.14.2 Equipment Signs ...................................................................................... 10-2

10.14.3 Pipe Markers ............................................................................................ 10-2

10.14.4 Danger Signs ........................................................................................... 10-2

10.14.8 Electrical and Control Equipment ........................................................... 10-3

10.45.3 Safety Clothing and Equipment .............................................................. 10-4

**Division 11 Equipment** .................................................................................... **11-1**

11.00 General ........................................................................................................... 11-1

11.05 Common Work for Equipment ................................................................... 11-1

11.50 Scientific Equipment .................................................................................... 11-6

11.53 Lab Equipment ............................................................................................. 11-6

11.53.34 Safety Station with Eye/Face Wash ......................................................... 11-6

11.60 Treatment Equipment .................................................................................. 11-7

11.62.56.19 Transfer Pumps ................................................................................ 11-7

11.64 Water Treatment Chemical Systems Equipment ....................................... 11-7

11.64.13.05 Common Work for Chemical Feed Equipment ............................... 11-7

11.64.13.06 Schedule ............................................................................................ 11-10

11.64.13.11 Valveboard ......................................................................................... 11-10

11.64.13.13 Peristaltic Metering Pump ................................................................. 11-11

11.64.73 Storage Tanks ......................................................................................... 11-15

11.90 Other Equipment .......................................................................................... 11-24

11.95 Heating, Ventilating, and Air-Conditioning .................................................. 11-24

11.95.1 Common Work for HVAC ......................................................................... 11-24

11.95.34 Fans .......................................................................................................... 11-24

11.95.34.1 Wall Ventilators .................................................................................. 11-24

**Division 12 Furnishings – This Division Not Used** ........................................... **12-1**

**Division 13 Special Construction – This Division Not Used** .............................. **13-1**

**Division 14 Conveying Systems – This Division Not Used** .............................. **14-1**

**Division 15 Mechanical** .................................................................................... **15-1**
Table of Contents

15.00 General.................................................................................................................................................... 15-1
15.05 Common Work for Mechanical................................................................................................................ 15-1
15.11 Open Trench Pipe Installation ................................................................................................................ 15-2
15.11.05 Common Work for Pipe Installation ............................................................................................... 15-2
15.11.50 Trench Patching ............................................................................................................................... 15-2
15.20 Pipe and Fittings...................................................................................................................................... 15-3
15.21 Common Work for Pipe and Fittings ......................................................................................................... 15-3
15.22 Metal Pipe and Fittings ............................................................................................................................ 15-3
15.22.05 Galvanized Steel Pipe ...................................................................................................................... 15-3
15.22.06 Copper Pipe and Fittings .................................................................................................................. 15-4
15.22.08 Brass/Bronze Pipe and Fittings ........................................................................................................ 15-4
15.23 Non-Metal Pipe and Fittings .................................................................................................................... 15-5
15.23.04 ABS Plastic Pipe and Fittings ........................................................................................................... 15-5
15.23.05 CPVC Pipe and Fittings – Solvent Weld ............................................................................................ 15-5
15.23.06 Polyvinyl Chloride (PVC) Pipe and Fittings for Sewer – Push on Joint ......................................... 15-5
15.23.12 PVC Pipe for Drain, Waste, and Vent (DWV) .................................................................................. 15-6
15.30 Valves ...................................................................................................................................................... 15-6
15.31 Common Work for Valves ....................................................................................................................... 15-6
15.32 Isolation Valves ...................................................................................................................................... 15-8
15.32.02 Resilient Wedge (Seat) Gate Valves .................................................................................................. 15-8
15.60 Pressure and Level Measurement ........................................................................................................ 15-8
15.60.01 Common Work for Pressure and Level Measurement ..................................................................... 15-8
15.61 Pressure Gauges ..................................................................................................................................... 15-9
15.75.13 Electronic Solenoid Valves .............................................................................................................. 15-10
15.80 Water Treatment Process Piping ........................................................................................................... 15-10

Division 16 Electrical ................................................................................................................................. 16-1

16.00 General.................................................................................................................................................... 16-1
16.05 Common Work for Electrical ............................................................................................................... 16-1
16.15 Electrical Grounding ............................................................................................................................. 16-7
16.15.1 Common Work for Electrical Grounding ......................................................................................... 16-7
16.30 Basic Panel Equipment and Devices ..................................................................................................... 16-8
16.31 Operating and Indicating Devices .......................................................................................................... 16-8
Table of Contents

16.31.4 Indicating Lights ................................................................. 16-8
16.31.5 Selector Switch ................................................................. 16-8
16.31.6 Pushbuttons .................................................................. 16-9
16.32 Panel Relays .................................................................. 16-9
16.32.1 Control Relays ................................................................. 16-10
16.35 Control Panel Accessories ................................................ 16-10
16.35.1 Terminal Blocks ............................................................... 16-10
16.35.2 Nameplates ................................................................ 16-10
16.40 Low Voltage Motor Control Equipment ................................. 16-11
16.41.2 Combination Motor Starter Disconnect ............................... 16-11
16.55 Switches and Protective Devices .......................................... 16-12
16.55.1 Common Work for Switches and Protective Devices ............ 16-12
16.55.13 Fuses ....................................................................... 16-12
16.55.16 Molded Case Circuit Breakers ........................................ 16-13
16.55.17 Instantaneous Magnetic Trip Breakers ............................. 16-13
16.55.18 Disconnect Switches ...................................................... 16-14
16.60 Conductors .................................................................. 16-14
16.61 Low Voltage Wire and Cable .............................................. 16-14
16.63 Signal Cable ................................................................ 16-16
16.70 Raceways, Boxes, and Fittings ............................................. 16-17
16.71 Raceways .................................................................... 16-17
16.72 Boxes and Enclosures ....................................................... 16-21
16.72.2 Outlet and Junction Boxes .............................................. 16-21
16.72.3 Watertight Enclosures .................................................... 16-22
16.75 Wiring Devices ................................................................ 16-23
16.75.1 Common Work for Wiring Devices .................................... 16-23
16.75.2 Receptacles ................................................................. 16-23
16.75.5 Plates .................................................................... 16-24
16.95 Testing ...................................................................... 16-25
16.95.1 Common Work for Testing ........................................... 16-25

Division 17 Automatic Control .......................................................... 17-1
17.00 General ........................................................................ 17-1

vi
# Table of Contents

17.05 Common Work for Automatic Control ................................................................. 17-1
17.06 Control System Integrator ...................................................................................... 17-6
17.07 Control System Programmer (Control System Programmer Contracted
Directly by Owner) ........................................................................................................ 17-9
17.08 System Description ................................................................................................. 17-9
17.10 Panels ...................................................................................................................... 17-11
   17.11 Panel Certifications .............................................................................................. 17-11
   17.12 Equipment Panels ............................................................................................... 17-11
17.20 Panel Components ................................................................................................. 17-12
   17.20.3 Terminal Blocks .............................................................................................. 17-12
   17.21 Power Supply and Protection .............................................................................. 17-12
   17.21.2 Normal Power Supply ..................................................................................... 17-12
   17.22 Wire and Cable ................................................................................................... 17-13
   17.22.2 Wiring ............................................................................................................. 17-13
   17.22.3 Cables ............................................................................................................ 17-13
   17.24 Switches and Relays ............................................................................................ 17-14
   17.24.2 Selector Switch ............................................................................................... 17-14
   17.24.3 Pushbuttons ..................................................................................................... 17-14
   17.24.4 Panel Relays .................................................................................................... 17-14
   17.25 Indicating Lights and Readouts ........................................................................... 17-15
   17.25.2 Pilot Lights ...................................................................................................... 17-15
17.90 Testing, Startup, and Training ................................................................................. 17-16
   17.90.1 Common Work for Testing, Startup, and Training ......................................... 17-16
   17.91 Tests and Inspections .......................................................................................... 17-17
   17.92 Startup ................................................................................................................ 17-20
   17.93 Training ............................................................................................................... 17-21
   17.94 Documentation .................................................................................................... 17-21
   17.94.2 Operations and Maintenance Manuals ............................................................ 17-21

**Division 18 Measurement and Payment** ................................................................. 18-1

18.0 General ..................................................................................................................... 18-1
   Bid Item 1 – Mobilization, Demobilization, Site Preparation, and Cleanup ................. 18-1
   Bid Item 2 – Bulk Sodium Hypochlorite Chlorination System ...................................... 18-1
### Table of Contents

Bid Item 3 – Chlorination Carrier Water Replacement ................................................................. 18-1
Bid Item 4 – Electrical .................................................................................................................. 18-2
Bid Item 5 – Telemetry and Automatic Control .......................................................................... 18-2
Bid Item 6 – Construction Records and O&M Manuals ............................................................... 18-2
Bid Item 7 – Testing, Startup and Training .................................................................................. 18-2
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.

1.11.01 Project Description

The City of Roseburg currently uses a mixed oxidant system for disinfection which is generated on-site. Since this system is aging and becoming increasingly difficult to maintain, the City desires to replace the existing mixed oxidant system with a bulk 12.5-percent sodium hypochlorite feed system. This project includes the demolition of the existing mixed oxidant system and the installation, testing, start-up and training services of the proposed bulk sodium hypochlorite feed system equipment.

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.

1.13 Permits and Licenses

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

- Building Permit
- Electrical Permit
- Disposal Permit
- Plumbing Permit

A copy of the Owner acquired permits are available at the Owner’s office for examination by bidders. Conform to the requirements of these permits and all other permits issued for this project.

1.15 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 warranties below. The date of project acceptance is defined as the date the final payment is sent to the Contractor from the Owner.

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

- Division 11.64.73.13 Chemical Storage Tank

1.30 ADMINISTRATIVE

1.31 Responsibilities

1.31.1 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 Testing, Startup, and Operation section below 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.

1.31.1.2 Contractor Conducted Progress Meetings

The Contractor shall schedule and hold regular on-site progress meetings at least every two weeks and at other times as requested by the Owner or as required by progress of the work. The Contractor, Owner, and all Subcontractors active on the site must attend each meeting. Contractor to provide an agenda covering the following items at a minimum, as applicable.

1. Review minutes of previous meetings.
2. Review of work progress.
3. Field observations, problems, and decisions.
4. Identification of problems that impede planned schedule.
5. Review of submittals schedule and status of submittals.
6. Review of off-site fabrication and delivery schedules.
7. Maintenance of progress schedule.
8. Corrective measures to regain projected schedules.
9. Planned progress during succeeding work period.
10. Coordination of projected progress.
11. Discussion of upcoming required inspections/approvals.
12. Maintenance of quality and work standards.
13. Effect of proposed changes on progress schedule and coordination.
14. Safety issues relating to work.
15. Other business relating to work.

1.31.1.3 Contractor Provided Schedule and Non-working Day Approval

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.

1.31.2 Owner Inspector’s Responsibility

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

1.33.1 Submittal and Shop Drawings

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: Barney Santiago, P.E.
   Email: bsantiago@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 take responsibility to 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.
- Applicable Specification and Drawings Reference.
- A stamp showing 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 stamp.

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 10 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 for all items:

1. Shop or equipment drawings, dimensions, and weights.
2. Catalog information.
3. Manufacturer’s specifications.
4. Special handling instructions.
5. Maintenance requirements.
6. Wiring and control diagrams.
7. List of contract exceptions.

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.

1.33.2 Substitutions

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 1.33.2.1 Substitutions Prior to Bid Opening. Requests for price increases after award will not be accepted.

1.33.2.1 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.

1.33.2.2 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.
1.40 QUALITY CONTROL

1.42 Reference Specifications

Work under this contract shall be performed in accordance with applicable sections of the current Standard Specifications for Road, Bridge and Municipal Construction, Oregon State Chapter, American Public Works Association, and Oregon 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:

- City of Roseburg Municipal Code
- City of Roseburg Electrical Code
- Douglas County Municipal Code
- IBC International Building Code
- UPC Uniform Plumbing 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
- OSSC Oregon Structural Specialty Code
- OESC Oregon Electrical Specialty Code

1.50 CONSTRUCTION SUPPORT

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.

At the close of this contract, the Contractor shall pay all utility bills that are outstanding, remove all temporary electrical, sanitary, gas, telephone and water facilities, and any other temporary service equipment that may remain. In addition, the Contractor shall arrange for the transfer of electrical and water accounts to the Owner’s name.

Temporary electrical power is available at the site. The Contractor may use existing 120 Volt power receptacles at the site. Additional construction power is the responsibility of the Contractor.
Temporary water is available at the site. The Contractor may use existing water from the hose bibs and building water supply as shown on the plans.

1.70 EXECUTION AND CLOSEOUT

1.75 Testing, Startup, and Operation

1.75.02 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.

Temporary Chemical Storage Tanks, Pumping Systems, and Piping

Upon successful completion of the leakage testing called for in Division 11 for the temporary sodium hypochlorite feed system, the Contractor shall provide two tote tanks of low-salt HASA sodium hypochlorite supplied by Cascade Columbia (503-432-8450) to flood the suction of the metering pump line(s). Contractor shall provide a temporary bypass from the discharge of the valve boards back to the product tank. Contractor shall run the metering pump in manual for a minimum of 24 hours to verify that all connections are leak proof and ready to be placed into service. Upon successful completion of this testing as verified by the Engineer or Owner, Contractor shall make all final connections and prepare for startup. Contractor shall neutralize all chemical product waste prior to disposing at the site. Contractor must provide all chemicals required to complete the testing, startup, and operational demonstration of the temporary sodium hypochlorite feed system.

Chemical Storage Tanks, Pumping Systems, and Piping

Upon successful completion of the leakage testing called for in Division 11 for the sodium hypochlorite product and day tanks, the Contractor shall provide sufficient chemical(s) solution in the product tank to flood the suction of the metering pump line(s). Contractor
shall provide a temporary bypass from the discharge of the valve boards back to the product tank. Contractor shall run the metering pump in manual for a minimum of 24 hours to verify that all connections are leak proof and ready to be placed into service. Upon successful completion of this testing as verified by the Engineer or Owner, Contractor shall make all final connections and prepare for startup. Contractor shall neutralize all chemical product waste prior to disposing at the site. Contractor must provide all chemicals or bulk storage containers required to complete the testing, startup, and operational demonstration.

Bulk Sodium Hypochlorite Feed System

After completion of all manufacturer required testing and the items required in Division 11 for the chemical system, the Contractor shall provide 1 full tanker truck of low-salt HASA sodium hypochlorite supplied by Cascade Columbia (503-432-8450). All alarms, deficiencies, leaks, etc. shall be rectified.

1.75.03 Scheduling of Owner Review for Testing

See Division 1.75.1 Scheduling 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 and Tuesdays so that the remainder of the week can be used to identify the stability of the control system for the SCADA system and treatment plant. Testing shall not start on a Thursday, Friday or the day before an Owner identified holiday.

1.75.05 Treatment System Testing

The Contractor and equipment suppliers shall provide all equipment, reagents, etc. to complete the testing, startup, operational demonstration and training portions of this project. The Owner's equipment, reagents, etc. will not be available for use by the Contractor or equipment suppliers.

Contractor shall be responsible for the calibration, startup, and initial performance to meet the specifications herein to the satisfaction of the Engineer and Owner. The Contractor shall
conduct all testing, startup, operational demonstration, and training coordination with the suppliers. The Contractor shall schedule all testing, startup, operational demonstration, and training activities with the Engineer and the Owner. Suppliers of specialized equipment such as: pump(s), on-site generation system(s), metering pump(s), water quality analyzer(s), control valve(s), and filtration vessel(s) shall provide a trained, qualified manufacturer’s representative to check installation and connection, verify settings, perform field tests as indicated, and certify in writing to Owner that its performance does meet all specifications. Testing, startup, training and operational demonstration shall not be a cause for claims for delay by the Contractor and all expenses for testing, startup, operational demonstration, and training in addition to the amount listed in the bid time for it shall be incidental to this Contract. The Contractor shall make arrangements for all materials, supplies, and labor necessary to efficiently complete the testing, startup, operational demonstration and training.

The placing of all improvements into service shall consist of three parts: Testing, Startup, and Operational Demonstration. Not less than 15 working days before the anticipated time for beginning the startup, the Contractor shall submit to the Engineer for approval, a complete plan for the following:

- Schedule of startup date(s)
- Schedule of operational demonstration date(s)
- Detail outline and schedule of procedures for startup
- Complete schedule of events to be accomplished during startup
- A list of equipment (pumps, on-site chlorination, etc.)
- An outline of work remaining under the contract that will be carried out concurrently with the demonstration phases

The startup date(s) will not be scheduled with the Engineer or Owner until the above plan is submitted for approval.

1.75.30 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. In general, the startup will consist of isolating the existing gas chlorination system, operating the on-site generation system and metering chemical into the treatment process. All pipes, and chemical feed lines shall be full prior to startup. Chemical feed systems will be adjusted to achieve proper dosing, and water quality will be verified by the manufacturers and then corroborated by the Inspector. Startup will continue with further checking of all instruments, operations, and sequencing. At least four successful starts and stops of the treatment systems will be required prior to acceptance of startup.

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.
1.75.35 Operational Demonstration

Operational demonstration shall be conducted after successful startup has been completed as determined by the Engineer and Owner. The purpose of the operational demonstration period is to demonstrate automated operation of the equipment and system(s) and to verify functional integrity of the system(s). This demonstration period shall occur under full operational conditions as determined by the Owner. The Owner reserves the right to simulate operations variables and equipment failures to verify the functional integrity of automatic and manual backup systems and alternate operating modes. The demonstration period shall be for five (5) consecutive working days with a minimum of eight (8) hours per day of operation. The date and time that the operational period shall begin and end will be agreed upon by the Contractor, Owner, and Engineer in advance of initiating the operational demonstration period. The City shall provide a certified operator during this period to provide operational or process decisions only. The Contractor shall provide equipment operation and maintenance; respond and repair any problems or failures that occur during this period. If, during the operational demonstration period, the aggregate amount of time used for repair, alteration, or unscheduled adjustments to any equipment or systems that renders the affected equipment or system inoperative exceeds 5 percent of the demonstration period, the operational demonstration will be deemed as failed and will be repeated. Any shut downs due to equipment or systems failures shall be corrected immediately by the Contractor. The Contractor must provide a report as to the cause of the shutdown/failure and current status of the system to the Owner’s operator before returning the equipment or system back to the auto position to continue the operational demonstration period. The Owner’s operator reserves the right to decide if the issue that caused the system to fail could potentially be a safety concern if the system were to be put back into auto. The Owner will provide contact information for on-call operations personnel for the week of operational demonstration prior to system testing.

1.79 Training and Documentation

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.

The Contractor shall remove 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.

1.79.1 Training

See Division 17.93 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.
1.79.2 Operation and Maintenance Manuals

See also Division 17.94 for additional requirements for automatic control systems manuals. Detailed requirements for specific equipment and systems may also be included in their respective specification sections.

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. Lubrication schedule including the applicable lubricant designation available from the Standard Oil Company of California.
C. Recommended preventive maintenance procedures and schedules. Schedule shall be provided for daily, weekly, monthly, quarterly, semi-annually and annually maintenance.
D. Disassembly and re-assembly instructions including parts identification and a complete parts breakdown for all equipment.
E. Weights of individual components of each item of equipment weighing over 50 pounds.
F. Name, location, and telephone number of the nearest suppliers and spare parts warehouses.
G. All manufacturers’ warranties. Include name, address, and telephone number of the manufacturer's representative to be contacted for warranty, parts, or service information.
H. Cleaning, repair, and maintenance instructions for each coating system.
I. Provide videotapes, video CDs or DVDs utilized in the manufacturer’s instruction program for the owner.
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 3 hard copies of O&M manuals. A duplicate CD copy may be provided but shall not substitute a hard copy unless approved by the Owner.

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 1.15 for details regarding required warranties for specific components.

1.79.3 Construction Record Drawings

Prior to receiving final payment for the work, the Contractor shall deliver a complete set of acceptable “As-Constructed” records to the Engineer. 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.
1.80 PERFORMANCE REQUIREMENTS

1.81 Seismic Restraint and Anchorage

Contractor shall furnish seismic restraint for all architectural components, equipment, tanks, machinery, piping, valves, conduit, and other mechanical and electrical components. Seismic restraint shall be designed to meet IBC (ASCE 7 Chapter 13 – “Seismic Design Requirements for Nonstructural Components”) code requirements. The following design values shall be used in calculating seismic forces:

| Ip = 1.5 | Sds = 0.645g | Seismic Design Category = D |

A complete seismic restraint system shall be provided including struts, straps, bolts, nuts, washers, etc. as required for secure attachment to foundations, pads, ceilings, floors, and/or walls.

Contractor shall submit either of the following in accordance with ASCE 7, 13.2.1 for all components:

1. Project-specific design and documentation prepared and submitted by a registered design professional.

2. Submittal of the manufacturer's certification that the component is seismically qualified by
   a. Analysis
   b. Testing in accordance with the alternative set forth in ASCE 7, Section 13.2.5.
   c. Experience data in accordance with the alternative set forth in ASCE 7, Section 13.2.6.

Special Certifications are required for the following systems for Seismic Design Categories C, D, E, and F. Systems shall be certified in accordance with ASCE 7, 13.2.2.

1. Mechanical and electrical equipment that must remain operable following the design earthquake. All mechanical and electrical equipment installed under this project falls under this category.

2. Components with hazardous contents.

All materials and fabrication shall be as required in these specifications. Contractor shall submit this information to the Owner for review prior to fabrication and installation.

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.
1.82 Pressure Ratings

Fittings, valves, pipe and fluid systems shall have pressure ratings equal to or greater than the pressures identified below, unless specifically called out otherwise in the plans or specifications:

<table>
<thead>
<tr>
<th>Equipment Function</th>
<th>Function Pressure</th>
<th>Working Pressure</th>
<th>Test Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemical Piping Upstream of Metering Pumps</td>
<td>10 psi</td>
<td>&lt; 10 psi</td>
<td>150 psi</td>
</tr>
<tr>
<td>Chemical Piping Downstream of Metering Pumps</td>
<td>60 psi</td>
<td>60 psi</td>
<td>150 psi</td>
</tr>
</tbody>
</table>

Function Pressure: The maximum pressure anticipated under normal operating conditions of this facility. This value is provided for the Contractor’s information, but typically is lower than the required pressure rating of the equipment.

Working Pressure: Manufacturer’s rating of maximum pressure during extended operation.

Test Pressure: Maximum pressure during project specific testing.
2.00 GENERAL

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

2.05 Common Work for Sitework

This division covers that work necessary for providing materials and performing all sitework as described in these specifications and as shown on the Plans.

Part 1 - General

Submittals

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

- General Fill
- Trench Backfill

Other Items listed in this section or required by the Owner.

2.10 SITE PREPARATION

2.10.5 Construction Access

Part 1 - General

Summary

The Contractor shall provide for all temporary site access and shall maintain vehicular site access at all times. Access shall be of a quality to permit Contractor’s forces and outside inspector’s safe and convenient ingress/egress. Unless specifically provided for in other bid items, the cost of building and maintaining construction access shall be incidental and no separate payment shall be made. Any bid items for aggregate materials (e.g. crushed rock, ballast, etc.) shall not relate to construction access unless the description of that bid item specifically states inclusion of the construction access.

Part 3 - Execution

Repair/Restoration

The Contractor is responsible for maintaining all construction accesses during construction and the cost of such maintenance shall be incidental to the bid price. Maintenance includes repairing settled and damaged areas, and providing dust control. Cost for maintenance due to rain, snow, wind, or other weather conditions shall be incidental to the bid price.

Cleaning

Wherever construction vehicle access routes intersect paved roads, provisions must be made by the Contractor to minimize the transport of sediment onto the paved road. The Contractor shall remove all dirt, mud, rocks, vegetation, or other deleterious material from all construction
equipment prior to leaving the site. This may include spray washing, sweeping, or other physical methods as necessary to remove materials.

If sediment or other debris is transported onto a paved road surface, the road shall be cleaned thoroughly by the end of the work day. Debris shall be removed from roads by shoveling or sweeping. Street washing shall be allowed only after debris has been removed in this manner.

2.11 Earthwork Materials

2.11.1 Common Work for Earthwork Materials

Part 1 - General

Acceptance at Site

Owner shall review the site near the end of each pay period to determine the equivalent percentage of earthwork completed compared to the total earthwork lump sum price. Contractor shall be paid based on the percentage completed based on Owner’s judgment of percent complete.

Part 2 - Products

Source Quality Control

All imported fill material shall be free of hydrocarbons (e.g. gasoline, diesel, oil, etc.), pesticides, herbicides and other hazardous volatile organic compounds (VOCs) and synthetic organic chemicals (SOCs). The Contractor shall provide certification to the owner that the fill is free of these chemicals.

2.11.2 General Fill

Part 1 – General

Summary

All fill required for this project that is not specifically defined as another type shall be “General Fill”.

References

Section 00405.14 of the Standard Specifications, Class A Backfill.

Part 2 – Products

Components

General fill shall be soil free of organics, debris, and other deleterious materials with no individual particles having a maximum dimension larger than 5 inches. The moisture content of the material and weather conditions at the time of placement will be used to determine the suitability of native materials for backfill as general fill.
Part 3 – Execution
Installation/Construction
All general fill shall be compacted in uniform layers not exceeding 12 inches in loose thickness and compacted to at least 90 percent maximum dry density based on the ASTM D-1557 (modified).

2.11.4 Pipe Bedding
Part 1 – General
Summary
All fill placed below and around buried utilities shall be “Gravel Backfill for Pipe Bedding.” The pipe bedding material has been selected to support the weight of the utility by distributing the load so that the completed utility and backfill system does not weigh more than the native material. In addition, the grain size has been selected so that the bedding will not migrate into the bottom of the trench. The Contractor must take particular care to maintain the integrity of the utility design by using the appropriate pipe bedding material where shown.

References
For Ductile Iron, Steel, or Concrete Pipe larger than 4-inch diameter: Bedding material shall conform with Section 00405.12 Bedding of the Standard Specifications and be open graded aggregate conforming with Section 02630.11

For PVC, HDPE, CPEP sewer, storm and water piping regardless of diameter and all other piping and conduit 4-inch in diameter or less conform with Section 00405.12 sand bedding of the Standard Specifications or as approved by the Inspector.

Pipe bedding used around restrained joint pipe must be a well graded cohesive material with fines. Rounded gravels and pea gravel are not acceptable.

Part 3 – Execution
Installation/Construction
Bedding material shall surround the pipe and conduits to the limits shown on the Plans and provide uniform support along the entire length without allowing concentrated loading at joints or bells or that results in any bridging of the pipe. All bedding material shall bear on firm subgrade and be compacted to firm and unyielding condition.

2.11.5 Trench Backfill
Part 1 – General
Summary
All fill placed above the pipe bedding in a trench shall be “Trench Backfill”. The trench backfill material has been selected to distribute surface loads over the utility. In addition, the grain size has been selected so that the trench backfill will not migrate into the pipe bedding or trench walls. The Contractor must take particular care to maintain the integrity of the utility design by using the appropriate trench backfill material where shown.
References

Trench backfill shall consist of materials conforming to Section 00405.14 Trench Backfill of the Standard Specifications and be Dense Graded conforming with Section 02630.10, or as approved by the Owner.

Part 3 – Execution

Installation/Construction

Trench backfill shall follow the requirements of Section 00405.40 of the Standard Specifications.

2.11.7 Gravel Base Course

Part 1 – General

Summary

All fill placed under paving, foundations or structures and next to native material shall be “Gravel Base Course” unless otherwise called out on the Plans.

References

Aggregate for gravel base course under structures, and foundations shall conform Section 02630.10, Dense – Graded 1½-inch - 0 of the Standard Specifications.

2.11.8 Gravel Top Course

Part 1 – General

Summary

Gravel surface paving as shown on the Plans shall be “Gravel Top Course”.

References

Aggregate for gravel base course under structures, and foundations shall conform Section 02630.10, Dense – Graded 1-inch – 0 or ¾-inch – 0 of the Standard Specifications.

2.12 Road Surfacing

2.12.1 Common Work for Road Surfacing

2.12.2 Cement Concrete Pavement

Part 1 – General

References

Cement concrete pavement, sidewalks, curb and gutter shall meet the requirements of Division 3. Construction shall comply with Section 00740 of the Standard Specifications.  

Double-check with ODOT section
Part 3 – Execution

Examination

Evidence of pavement damage such as surface cracking, ponding or other variations in surface consistency shall be investigated by the Contractor and reported to the Engineer.

Construction

Pavement areas damaged by construction activities shall be removed and reconstructed at the Contractor’s expense to the road agency’s standards.

Manhole covers, valve covers, survey markers, and other existing surface features shall be adjusted to the finished grade of the new pavement. Adjustment of utility features to grade shall be in conformance with the local road agency standards. Catch basin grates shall be set 0.1 feet below finish grade.

2.12.3 Hot Mix Asphalt (HMA) / Asphalt Concrete Pavement (ACP)

Part 1 – General

Definitions

The Plans and specifications may call out Hot Mix Asphalt (HMA) or Asphalt Concrete Pavement (ACP). The terms are synonymous.

References

Hot Mix Asphalt (HMA) shall comply with Section 00744 of the Standard Specifications. All HMA shown on the Plans shall be Commercial HMA unless otherwise noted. Furnish, place, spread, and compact HMA to the thickness shown on the Plans.

HMA used for road paving and patching shall comply with Section 00744 of the Standard Specifications for HMA Class \( \frac{1}{2} \)-inch. HMA used for driveways and parking lots shall be HMA Class \( \frac{3}{8} \)-inch. Furnish, place, spread, and compact ACP to the thickness shown on the Plans.
Division 3
Concrete

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

3.05 Common Work for Concrete
Part 1 - General
This division covers that work necessary for furnishing and installing all concrete as described in these specifications and as shown on the Plans.

References
Materials shall conform to the following standards:
- Cement - ASTM C-150
- Coarse aggregate - ASTM C-33
- Fine aggregate - ASTM C-33
- Admixtures - ASTM C-494
- Air-entraining admixtures – ASTM C-260
- Fly Ash – ASTM C-618
- Admixture and products in contact with potable water – NSF 61

Submittals
Submittal information shall be provided to the Owner for the following items:
- Concrete mix design including aggregate gradation and substantiating strength data.
- Admixture Data
- Special placement procedures for hot or cold weather
- Construction Joint Plan
- Concrete anchors
- Concrete anchor installer certification per ACI/CRSI Adhesive Anchor Installer Certification Program.
- Schedule of surface finishes
- Rebar mill certifications
- Rebar placement shop drawings
- Precast concrete items
- Schedule of form inserts
- Waterstop and bentonite waterstop – Include sample joint(s) if joints are to be field welded.
• Grouts
• Embedded items
• Form ties for liquid containment structures
• Form Liners and associated products
• Form Release agent
• Method of plugging through-bolt holes

Concrete mix designs shall be submitted to the engineer for approval a minimum of two weeks prior to placing any concrete. The mix design shall include the amounts of cement, fine and coarse aggregate, water and admixtures, as well as the water cement ratio, slump, concrete yield, aggregate gradation, and substantiating strength data in accordance with ACI 318, Chapter 5. A batch plant inspection may be required, the cost of which shall be paid by the Contractor. Review of mix submittals by the engineer of record indicates only that information presented conforms generally with contract documents. Contractor or supplier maintains full responsibility for specified performance.

Part 2 - Products

Components

Nominal maximum size for aggregates is the smallest standard sieve opening through which the entire amount of aggregate is permitted to pass. Provide intermediate aggregate grades as required to achieve a well-graded mix.

All concrete surfaces exposed to weather or standing water shall be air entrained. Total air content shall be in accordance with IBC requirements unless specified otherwise herein. Air shall be measured at the truck, unless otherwise agreed to.

Water used in concrete shall be potable.

Fly ash may be substituted for up to 15 percent of the required cement, except where noted.

Mixes

Concrete shall be mixed, conveyed, and proportioned in accordance with IBC section 1905.

The concrete mix shall include the amount of cement, fine and coarse aggregate, including aggregate gradations, water, and admixtures as well as water cement ratio, slump, concrete yield, and sustaining strength data in accordance with these specifications, the requirements of the International Building Code Section 1905, and the requirements of ACI 318.

Part 3 - Execution

Inspection

See Statement of Special Inspections on the Drawings for special inspection requirements. Provide two (2) full working day notice to Owner prior to needing the required inspections.

Also comply with local building department and permit requirements for inspection and notification.
The Contractor shall repair, replace or modify, as appropriate, any items noted in the Special Inspector’s inspection or the building department inspection.

**Testing**

Concrete strength tests shall be performed per section 1905.6 of the IBC and per the requirements noted herein. The Owner will provide and pay all costs of concrete testing. The Engineer shall be furnished with copies of all inspection reports and test results.

Cylinders used for concrete strength tests shall be 6 by 12. Four by 8 cylinders may be used for mixes with maximum aggregates less than 1-inch, however the testing lab must apply a 0.94 multiplier to the compressive strength test results unless data acceptable to the Engineer is presented that would justify a higher multiplier. All mixes utilizing aggregates over 1 inch shall be tested using 6 by 12 cylinders.

When 4 by 8 cylinders are utilized AASHTO T23 requirements shall be followed, and the retainer used with neoprene pads when testing for compressive strength shall be constructed according to ASTM C 1231.

The Contractor will coordinate all concrete testing with the testing agency. Costs will be paid by the Owner.

Give the Owner and testing agency 48-hour notice prior to concrete placement. If Contractor fails to provide the required notice, the Owner may elect to cancel the affected concrete placement. Contractor shall be responsible for costs and delays due to improper notification.

If the Contractor schedules a concrete placement and does not notify the Owner and testing agency of a cancellation within 24 hours of the scheduled placement, the Contractor shall pay the testing agency costs for an unnecessary trip. If the Contractor fails to provide the testing agency with adequate notification and testing agency cannot attend concrete placement, Contractor shall reschedule placement. Contractor shall be responsible for all associated delays.

The Contractor shall provide all assistance and cooperation necessary to testing personnel to obtain the required concrete tests. Contractor and Owner will have access to testing results as soon as they are available.

The testing agency shall take a minimum of four samples for every 50 yards of concrete placed (and a minimum of four per pour); one for a 7-day test, two for 28-day tests, and one for backup testing in case the other two samples do not meet design strength. Additional samples may be taken to verify strength prior to form removal at the Contractor’s expense.

### 3.06 Maintenance of Concrete

#### 3.06.30.71 Rehabilitation of Cast-in-Place Concrete

**Part 1 - General**

This division covers that work necessary for repairing spalled and damaged concrete. Repair any areas with deterioration exceeding ½-inch, where rebar is exposed or where directed by the Owner.
Part 2 - Products

Materials

CONCRETE REPAIR MATERIAL: SikaTop 111 PLUS or equal cement-based repair mortar. Mortar shall be ANSI/ NSF Standard 61 approved if in contact with potable water and contain a corrosion inhibitor. See Manufacturer’s Literature for primer and auxiliary products appropriate for use with the repair material.

SILANE SEALER shall be alcohol based, 95 percent silane. No fillers, sterates or paraffins are allowed. Use DUR A PELL 100 as manufactured by Chemprobe Coating Systems or equal.

Part 3 - Execution

Preparation

The Contractor shall be familiar with the product and methods and be prepared to discuss the repair procedure at the Preconstruction Meeting.

High pressure power-wash the exposed structure to remove all loose, delaminated concrete to sound concrete.

Surface Preparation: Remove loose, delaminated concrete to sound concrete. Where corrosion of the reinforcement exists, continue bulk removal along the reinforcing steel and adjacent areas with evidence of corrosion-induced damage. Under-cut all exposed reinforcing steel by a minimum of ¼-inch. The shape of the prepared cavity should be square or rectangular in shape. The edges of the patches shall be saw-cut perpendicular to the surface to a minimum depth of ½-inch. Repair area shall be a minimum of ½-inch deep throughout. Use abrasive blasting to remove residual dust, debris, fractured concrete, and contaminants that prevent proper bonding. Following abrasive blasting, blow out repair areas with oil-free compressed air. The final surface texture should be rough with minimum ⅛-inch amplitude.

Treatment of exposed reinforcement: All signs of corrosion should be removed from exposed reinforcing steel by an abrasive blasting, wire wheel or needle scaler. If the cross-sectional area of the reinforcing steel has been significantly reduced, the engineer should be consulted. Prime reinforcing as recommended by the repair material manufacturer.

Installation

Surface Saturation: Saturate surface with potable water. The base concrete shall be in a saturated surface dry (SSD) condition prior to application of repair material to prevent a rapid loss of moisture from the repair material and into the substrate.

Mixing and Application of Repair Material: Mixing and application shall be in strict accordance with the manufacturer’s instructions. Apply the material with adequate pressure before the bond coat dries. Thoroughly consolidate the repair material into the corners of the patch and around any exposed reinforcement in the repair zone. If a second lift is required, thoroughly roughen the surface of the first lift by scoring the soft mortar to achieve an aggressive finish, similar in profile to the prepared concrete substrate. If the second lift will not be immediately applied, keep the first lift moist until application of the second lift. Finish to match existing surface. Cure using curing compound.
Apply silane sealer as specified to exposed surfaces and edges of roof slab.

3.10 FORMING AND ACCESSORIES

3.11 Formwork

3.11.13 Cast in Place Forming

Part 1 – General

The Contractor shall submit a construction joint plan to the Engineer for review prior to formwork and rebar installation if altered from that shown on the Plans. Modifications to the construction joints shall be submitted to the Engineer no less than 7 working days prior to placing the forms and rebar.

Part 2 – Products

Materials

Unless otherwise directed, coat contact surface of forms with colorless, non-staining, mineral oil that is free from kerosene, or other approved suitable material, to permit satisfactory removal of forms without concrete damage. Form-release agent for interior of potable water storage structures shall be National Sanitation Foundation Standard (NSF) No. 61 approved for use in direct contact with potable water.

Form construction for surfaces covered with backfill shall be made of steel, plywood, or dressed, matched lumber. Form construction for exposed surfaces shall be made of new plywood or steel without surface markings.

Form ties for use in liquid containment structures shall be standard plastic cone snap-ties with ¾-inch diameter neoprene waterstop washer or removable taper ties. Use Greenstreak X-plugs with removable taper ties or equal. Contractor shall submit to the Engineer form ties to be used for review prior to installation.

Part 3 - Execution

Installation/Construction

Concrete forms shall be sufficiently tight to prevent leakage of concrete or mortar and shall be properly braced or tied together to maintain desired position and shape until removed.

Conduits, pipes and sleeves of any material not harmful to concrete and within the limitations of ACI 318, Section 6.3 are permitted to be embedded in concrete with approval of the Engineer. Provide a ¾-inch chamfer or radius at all exposed corners and edges, unless specifically stated otherwise on the Plans.

Forms shall remain in place until the concrete has developed sufficient strength to withstand imposed loads without damage or deflection. Wall and slab forms shall remain in place for a minimum of 24 hours after completion of the pour. Forms for beams and suspended slabs shall remain in place for a minimum of 14 days AND until concrete has developed 28-day design strength, unless approved by the Engineer. The Contractor shall coordinate with the testing lab to verify concrete strength prior to form removal.
Do not allow water to flow through areas where forms are to be placed. During form construction and prior to placement of concrete, keep footings and floor slab areas free of standing water.

Field Quality Control

Variations from plumb, specified grade, conspicuous lines, and walls shall not exceed plus or minus ¼-inch in any 10-foot length, and shall not exceed one inch over the entire length. Variations from dimensions shall not exceed plus or minus ½-inch. Closer tolerances shall be achieved by the Contractor as necessary to accommodate equipment and other permanent materials.

3.15 Accessory Materials

3.15.05 Pipe Penetrations through Concrete

Part 1 - General

Summary

Structures not holding water or unburied structures: Unless identified on the Plans, all pipes larger than two inches passing through poured-in-place concrete floors and walls shall be isolated from the concrete.

Part 2 - Products

Materials

Provide a Link-Seal system (or approved equal).

Part 3 - Execution

Examination

Wrapping must be inspected and approved by Engineer prior to concrete pour. Gaps, tears, or looseness in wrapping will be cause for rejection.

Installation

Install Link-Seal per manufacturers instruction either within a cast-in-place sleeve or core drill a clean hole.

3.15.19 Concrete Anchors

Part 1 - General

Quality Assurance

Installation of adhesive anchors shall be performed by personnel certified in accordance with the ACI/CRSI Adhesive Anchor Installer Certification Program. In lieu of certification the installer shall attend on-site training held by the adhesive manufacturer prior to the installation of adhesive anchors.
Part 2 - Products

Materials

Concrete Anchors shall be Hilti HIT 500-V3, Simpson SET-XP, or Powers PE1000+ Adhesive Anchors.

CMU Anchors shall be Simpson SET-XP Adhesive Anchors.

Anchorage into non-grouted, hollow masonry cells is not allowed unless specifically called out on plans. Where allowed, anchors in unreinforced masonry cells shall be Simpson SET-XP epoxy adhesive in conjunction with the Simpson Optimesh screen.

For wall mounted equipment weighing less than 250 pounds, Simpson Titen-HD Screw Anchors may be used in grouted or non-grouted CMU cells.

Threaded rod shall be stainless steel except in dry locations.

Part 3 - Execution

Installation

Install in accordance with Manufacturer’s recommendations. Special Inspection in accordance with IBC, Section 17, must be provided. Provide a minimum of 48 hours’ notice to Engineer prior to starting installation. Concrete anchors shall not be used to resist tension or fatigue loading without Owner’s evaluation and approval.

Use threaded rod or reinforcing bar as shown on the drawing, and meeting Manufacturer’s recommendations. Provide minimum embedment as shown. Holes shall be drilled with carbide-tipped drill bit. Holes shall be cleaned of dust and debris. Adhesive shall be inserted with a mixing nozzle.

3.20 REINFORCING

3.21 Reinforcing Steel

3.21.13 Reinforcing Steel

Part 1 - General

References

ACI – American Concrete Institute- latest edition


Part 2 - Products

Materials

Grade – ASTM A706, Grade 60

ASTM A615, Grade 60 shall be permitted if:

(a) The actual yield strength based on mill tests does not exceed fy by more than 18,000 psi; and,
(b) The ratio of actual tensile strength to the actual yield strength is not less than 1.25.

Detailing - ACI 318 and ACI 315

Lap requirements - See schedule on Plans or as required by ACI 318

Tie wire - 16 gauge minimum

Bar supports shall conform to “Bar Support Specification” CRSI Manual of Standard Practice, MSP-1-80. Provide Class 1, plastic protected bar supports. Use pre-cast concrete blocks to support bars off ground. Bar supports in water holding and buried structures shall be non-metallic.

Bar supports for the bottom rebar mat of suspended slabs or beams in water holding structures must be point supports (chairs or dobbies), not continuous.

Part 3 - Execution

Installation

Reinforcing steel shall be detailed in accordance with ACI 315 and 318 and as shown on the Plans. Lap all reinforcements in accordance with “the reinforcing splice and development length schedule”. Provide corner bars at all wall and footing intersections. Bend wire bar ties away from formwork to provide the same concrete clearance as shown on the Plans to the bars.

Welding of reinforcing steel shall not be performed unless specifically approved by the Engineer. If approved, Contractor will arrange and pay for all required Special Inspections associated with welding of reinforcing steel.

Field Quality Control

Reinforcing steel shall be free of rust and loose scale at time of concrete placement. Bars with kinks, improper bends, or reduced cross-section due to any cause will not be used. Bars shall not be field bent. Bars may not be tack-welded or otherwise heated.

If, within the project warranty period, rust spots appear on the concrete due to failure to achieve proper clearance on the rebar or wire ties, the Contractor shall grind out and patch the areas using a method satisfactory to the engineer.

3.22 Steel Welded Wire Reinforcement

Part 1 – General

Design Requirements

Hook dimensions and diameters of bends shall be in accordance with the ACI 318.

Fabrication tolerances shall be in accordance with the requirements of ACI 318.

Welded wire reinforcement (WWR) shall conform to the latest edition of ASTM A185 or A497. Galvanizing shall conform with ASTM A 641/A 641M, for cold-worked wire, or ASTM A123, for hot-dipped galvanizing of welded wire sheets/mats.
Plastic or wire bar supports, such as chairs and bolsters, shall conform to industry practice as described in the WRI “WWR-500, Manual of Standard Practice” or “TF 702 – Supporting WWR”.

**Part 2 – Products**

*Components*

For galvanized reinforcing, tie wires and metal clips shall be plastic coated or galvanized.

**Part 3 - Execution**

**Preparation**

Wire reinforcement shipped in rolls shall be straightened into flat sheets before being placed.

**Construction**

Reinforcement shall be cut and bent to the shapes shown on the Plans. All reinforcement shall be cold bent, unless otherwise permitted by the Engineer. Reinforcement partially embedded in concrete shall not be field bent, except as shown on the Plans or permitted by the Engineer.

Steel reinforcement shall be accurately placed as shown on the Plans and firmly held in positions during the placing and finishing of concrete. Reinforcement shall be lapped and tied around the perimeter of each sheet in order to maintain the proper positioning of the reinforcement. Lap splices shall have a minimum of two ties per spliced length. With the exception of tie down bars, welding (tack welding) will not be permitted.

Reinforcement shall be supported in its specified and proper position by use of precast blocks, plastic or wire/ bar supports, supplementary bars, side form spacers or other approved devices. Such devices shall be sufficiently strong and properly placed at frequent intervals so as to maintain the cover between the reinforcing and the surface of the concrete during concrete placement.

### 3.30 CAST-IN-PLACE CONCRETE

#### 3.30.01 Common Work for Cast in Place Concrete

**Part 1 - General**

**Scheduling**

Contractor shall schedule and attend a Concrete Placement meeting at least one week prior to placing concrete. The following shall attend:

- Owner
- Engineer
- Contractor
- Testing Laboratory Representative
- Concrete Supplier

The following shall be discussed at the meeting:
• Safety (Contractor’s sole responsibility)
• Batching and Delivery, Adjustments to Mix; Site Dosing
• Placement Rates and Anticipated Schedule of Placing and Finishing
• Site Layout – Holding Area; Pump Truck Location; Truck Wash-out Area; Parking area
• Equipment – Pumps and Appurtenances; Vibrators; Spare Equipment
• Concrete Testing Procedures
• Curing

**Delivery**

Concrete shall be transported in a truck mixer to the jobsite and discharged within 1.5 hours after cement has been added to water or aggregates. Rejected concrete will be at Contractor’s expense.

**Part 2 - Products**

**Components**

If allowed, curing materials shall conform to ASTM C-171 and liquid membrane-forming compounds shall conform to ASTM C-309. When concrete is to be coated or stained, use UV-dissipating form release and curing compounds.

**Part 3 - Execution**

**Preparation**

Do not place concrete during rain, sleet, or snow until water and freezing protection is provided.

Before beginning placement of concrete, remove hardened concrete and foreign materials from inner surface of mixing and conveying equipment. Before depositing concrete, remove debris from space to be occupied by the concrete. Secure reinforcement in position to prevent movement during concrete placement.

At the beginning of the concrete pour for walls taller than 8 feet, place a 1½ to 2½-inch thick grout pad prior to placing the concrete for the wall. Grout mix shall consist of fine aggregates, concrete and water in the same ratios as used in the wall concrete. The placement of the concrete shall proceed immediately after the grout placement so as to prevent any cold joints.

At construction joints, thoroughly clean surface of existing concrete to remove laitance. Roughen existing concrete surface to expose aggregate uniformly and apply approved bonding agent to existing concrete in accordance with manufacturer’s recommendations. Prior to placing fresh concrete, dampen joint and coat with grout mixture in accordance with ACI 301, Section 8.5.

**Installation**

Placement shall be in accordance with IBC, Section 1905.
Place no concrete when air temperature is below or expected to be below 40 degrees during the 28-day curing period unless a low temperature concrete mix has been approved by the Owner. Provide adequate equipment for heating materials and protecting concrete during freezing or near freezing weather. Keep materials, reinforcement, forms, and ground in contact with concrete free from frost at time of placement. Heat mixing water as required. Use no materials containing ice.

Place no concrete when air temperature exceeds or is expected to exceed 85 degrees during the 28-day curing period unless a high temperature placement plan has been approved, and unless adequate precautions are taken to protect work. Cool ingredients prior to mixing. Flake ice or crushed ice of a size that will melt completely during mixing may be substituted for all or part of water. Cool forms and reinforcing prior to placing concrete.

Handle concrete from mixer, ready-mixed truck, or from transporting vehicle to place of final deposit by methods which prevent separation or loss of ingredients. Under no circumstances shall concrete that has partially hardened be deposited.

Place concrete in maximum lifts of 3 feet. Deposit concrete continuously so that no concrete will be deposited on concrete which has hardened sufficiently to cause formation of seams and planes of weakness within the section. If a section cannot be placed continuously, locate and reinforce construction joints at points as provided for in the Plans or as approved by the Owner. Maximum concrete drop shall be 5 feet.

Consolidate concrete by vibration, supplemented by hand spading, rodding, forking, or tamping. Thoroughly work concrete around reinforcement, around embedded items, and into corners of forms to eliminate air or rock pockets which may cause honeycombing, pitting, or planes of weakness. Insert and withdraw internal vibrators at points approximately 18 inches in each direction and extend into the lower concrete lifts. At each insertion, the duration shall be sufficient to consolidate the concrete; but not sufficient to cause segregation. Do not use vibrators to transport concrete within forms. Consolidate slabs by utilizing vibrating screeds, roller pipe screeds, internal vibrators, or other approved methods. Have a spare vibrator available at jobsite during concrete placing operations.

After removal of forms, cut out and patch defects in concrete surfaces. Remove form tie cones. Cut or snap off form ties to a depth of ¾-inch. Chip out rock pockets, holes from form tie removal, and other defects to solid concrete. Repair defects in accordance with 3.01.30.71.

Curing

All concrete shall be water-cured in accordance with ACI 308.1 unless approved in advance by the Owner. If allowed, curing compound shall be applied immediately after finishing or form removal. When plastic or burlap covers are used to augment or protect curing, extend sheeting beyond the edges of the concrete and secure against wind lift. Inspect and adjust curing systems daily, including over weekends and holidays.

Water holding structure floors and bases to be cured by water flooding. Where a continuous waterstop is installed around the perimeter, fill up against the waterstop. Where a waterstop is not part of the final product or is not tall enough, provide temporary barriers. Outside the waterstop, water cure using soaker hoses and plastic or burlap covers. Use of curing
compounds outside the water stop may only occur with the approval of the Owner, approval should not be assumed.

Curing compounds are not permitted on surfaces that will receive coatings.

### 3.31 CONCRETE MATERIALS

#### 3.31.02 Structural Concrete

**Part 1 - General**

**Summary**

All concrete as shown on the Plans not used for liquid containment and below-grade structures, ringwalls, and mass concrete and not called out otherwise. Use water reducers as required to achieve slump. Hydraulic Concrete may be substituted.

**Performance Requirements**

**28-day compressive strength - 4500 psi minimum**

**Slump** - Without plasticizers; 4 inches for floor and roof slabs, 7 inches for walls. With plasticizers, maximum 9 inches or as desired for placement.

**Part 2 - Products**

**Mixes**

- Water/cement ratio - 0.40
- Nominal maximum aggregate size – ¾-inch (AASHTO Grading No. 67)
- Entrained air ratio – 3.5 percent minimum to 6.5 percent maximum

### 3.31.09 Controlled Density Fill (CDF)

**Part 1 - General**

**Submittals**

Revisions to the mix design shall be submitted to the Engineer for approval.

**Performance Requirements**

CDF as shown on the Plans or as directed by the Engineer shall be proportioned to be flowable, non-segregating, and excavatable, and shall conform to the following requirements:

- **Maximum Compressive Strength 300 (psi).**
- **Minimum 28-day compressive strength 100 (psi).**

**Part 2 - Products**

**Mixes**

- Pounds of cement per cubic yard (approx.) 50.
• Pounds of fly ash per cubic yard (approx.) 250.
• Pounds of dry aggregate per cubic yard (approx.) 3,200.

If air containing or water reducing admixture is used for flowability, total water and aggregates may be adjusted for yield. Weights may be adjusted for flowability and pumppability.

Part 3 - Execution

Field Quality Control

The Contractor shall protect CDF for at least 24 hours after placement or for a duration as necessary to prevent displacement by construction equipment or traffic. CDF placing may be started if weather conditions are favorable, when the temperature is a minimum of 34 degrees Fahrenheit and rising. At the time of placement, CDF must have a temperature of at least 40 degrees Fahrenheit. Placing shall stop when the temperature is 38 degrees Fahrenheit or less and falling. CDF shall not be placed on frozen ground.

3.35 SURFACE FINISHING

3.35.01 Common Work for Surface Finishing

Part 2 - Products

Finishes

Each concrete area that requires finishing shall conform to one of the following requirements:
• Interior Floors - Floatted
• Equipment Pads - Sacked Wall

Part 3 - Execution

Preparation

Do not place concrete which requires finishing until the materials, tools, and labor necessary for finishing the wet concrete are on the job and acceptable to the Owner. If rainfall is possible, tent the work area prior to the pour and maintain protection until the concrete is cured sufficiently to resist damage.

3.35.05 Floated Finish

Part 3 - Execution

Construction

Consolidate, strike off, and level concrete; but do not work further until ready for floating. Begin floating when water sheen has disappeared and surface has stiffened sufficiently to permit floating operations. Consolidate surface with power-driven floats. Hand floating may be used if area is small or inaccessible to power units.
Field Quality Control
Check surface planeness during or after first floating. Cut down high spots and fill low spots
to produce surface with tolerance of \( \frac{1}{4}\)-inch in 10 feet in any direction. Refloat to a uniform,
smooth, sandy texture immediately after leveling.

3.60 GROUTING

3.62 Non-Shrink Grout

Part 1 - General

Summary
Use Precision Non-Shrink Grout for grouting all equipment base plates, pipe supports, and
base plates for metalwork. Precision Non-Shrink grout may also be used for all other non-
shrink grouting operations. General Purpose Non-Shrink grout may be used for any
applications other than those noted for Precision Non-shrink Grout. Non-shrink grout shall
be used to seal all new pipe and conduit penetrations (watertight) into and out of all concrete
and CMU block walled structures.

Storage and Handling
Stockpile grout to prevent contamination from foreign materials and store admixtures to
prevent contamination or damage from excess temperature change

Part 2 - Products

Materials

Precision Non-Shrink Grout:
Provide a high-precision, fluid, non-shrink, quartz or non-catalyzed metallic aggregate
grouting material. Provide a ready-to-use grout that hardens free from bleeding, settlement,
or drying shrinkage when mixed, placed and cured at any consistency – fluid, flowable,
plastic or damp-pack.

Provide precision, non-shrink natural aggregate grout that when cured produces the
following properties:

A. Compressive Strength at fluid consistency (ASTM C 109-90-Modified): 3500 psi
\( (24 \text{ MPa}) \) at 1 day, 7500 psi \( (52 \text{ MPa}) \) at 28 days.

B. Passes ASTM C 1107 as a grade B grout when tested as temperature minimum and
maximums of 45 degrees Fahrenheit to 90 degrees Fahrenheit (8 degrees Celsius to
32 degrees Celsius) at a working time of 30 minutes. Grout must be tested at a fluid
consistency per ASTM C 939 and remain fluid at temperature range minimum and
maximums for the 30-minute working time. All materials including water must be mixed
and tested at temperature minimum/maximums.

C. Modulus of Elasticity at 28 days at fluid consistency (ASTM C 469): \( 3.0 \times 10^6 \) psi
\( (20.7 \text{ GPa}) \) minimum, \( 3.9 \times 10^6 \) \( (27.0 \text{ GPa}) \) maximum.
D. Coefficient of Thermal Expansion for fluid consistency (ASTM C 531): 7.5 x 10^(-6)/
degrees Fahrenheit maximum (13.5 x 10^(-6)/ degrees Celsius).

E. Flexural strength at 28 days for fluid consistency (ASTM C 78): 1300 psi (7.9 MPa).

F. Resistance to rapid freezing – thawing (ASTM C 666, Procedure A): 300 cycles- min
RDF 90 percent.

G. Split tensile strength at 28 days at fluid consistency (ASTM C 496): 450 psi (3.1 MPa).

H. Pass 24-hour grout test under stated temperature, time and fluidity constraints. See MBT
Protection and Repair 24-hour Grout Form.

Precision non-shrink grout shall be Masterbuilders 928 or Embeco 885 Grout or approved
equal.

General Purpose Non-Shrink Grout:

General Purpose Non-shrink grout shall meet the compressive strength and nonshrink
requirements of CRD-C 621, Grades B and C; Corp of Engineers Specification for
Non-shrink grout; and ASTM C 1107, Grades B and C. General Purpose Non-shrink grout
shall be Masterflow 713 Plus or Embeco 636 Plus or approved equal.

Provide curing compounds as recommended by the grout manufacturer.

Water to be used in mixing the grout shall be potable.

Mixes

Comply with grout manufacturer’s recommendations for mixing procedures.

Adjust water temperature to keep mixed grout temperature in the range of 45 degrees
Fahrenheit (7 degrees Celsius) and 90 degrees Fahrenheit (32 degrees Celsius)
minimum/maximum.

Use cold or iced water to extend working time in hot weather or in large placements.

Use warm water in cold conditions to achieve minimum as mixed temperatures.

Part 3 - Installation

Preparation

Mechanically remove unsound concrete within the limits of the grout placement.

Remove at least 1/4-inch (6mm) of existing concrete facing and continue removal as required
to expose sound aggregate.

Thoroughly clean the roughened surface of dirt, loose chips, and dust. Maintain substrate in
a saturated condition for 24 hours prior to grouting. Surface should be saturated surface dry
at time of grouting.

Clean baseplates and other metal surfaces to be grouted to obtain maximum adhesion.
Remove loose rust and scale by grinding or sanding.

Comply with grout manufacturer’s recommendations for form construction. Construct
forms to be liquid tight.
Installation

Place grout mixture into prepared areas from one side to the other. Avoid placing grout from opposite sides in order to prevent voids. Work material firmly into the bottom and sides to assure good bond and to eliminate voids.

Ensure that foundation and baseplate are within maximum/minimum placement temperatures. Shade foundation from summer sunlight under hot conditions. Warm foundation when foundation temperature is below 45 degrees Fahrenheit (7 degrees Celsius).

Wet cure exposed shoulders for 48 hours followed by two coats of curing compound for best results. The minimal requirement is to wet cure until grout has reached final set, followed by two coats of curing compounds.
Division 4
Masonry – This Division Not Used
Division 5
Fabricated Metalwork and Structural Plastics – This Division Not Used
Division 6
Carpentry – This Division Not Used
Division 7
Thermal and Moisture Protection

7.00 GENERAL

This division covers furnishing all labor, materials, and equipment for providing a structure that is completely weather-tight.

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

7.05 Common Work for Thermal and Moisture Protection

Part 1 - General

Submittals

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

- Thermal insulation
- Piping insulation

7.20 THERMAL PROTECTION

7.21 Thermal Insulation

7.21.10 Exposed Small Piping Insulation

Part 2 – Products

Manufacturers

Insulation shall be equal to S and S Industries.

Part 3 – Execution

Installation

All exposed piping 1½-inch and less used to distribute hot, tepid, cold, potable and non-potable water shall be insulated with closed-cell polystyrene insulation pre-slit and installed per manufacturer’s written information. Insulation shall be sized to match the diameter of the piping.
8.00 GENERAL

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

8.05 Common Work for Openings

Part 1 - General

Summary

This division covers furnishing all labor, materials, and equipment necessary for providing all interior and exterior doors, frames, and windows.

8.90 LOUVERS AND VENTS

8.90.01 Common Work for Louvers and Vents

Part 1 – General

Related Sections

• Division 17.08 - HVAC Functional Control

System Description

Ventilator shall be provided with explosion proof motors if noted in the Plans.

Design and Performance Requirements

See Louver and Damper Schedule on Plans and Functional Control description for design and performance requirements.

Submittals

Submit detailed product information including specifications, sizing information, dimensional drawings, coating systems, and available colors, and other information relevant to this project.

Part 2 – Products

Manufacturers

The following manufacturers are considered to be acceptable “or equals” unless otherwise noted on the Plans or elsewhere herein.

• Pottorff
• Cesco
• Louvers & Dampers, Inc.

Accessories

Provide all accessories needed for a complete installation including wall and roof thimbles, backguards, and mounting sleeves.
Components

A filter frame and an insect screen shall be provided on the interior side of all intake louvers. The filter frame shall allow for easy installation and removal of standard size filters. Provide one set of filters.

In chemical rooms or other corrosive environments, all materials in contact with the room air shall be fully resistant to corrosion attack from the atmosphere.

Finishes

All louvers shall be coated with factory Kynar, or powder coat finish, color to match exterior color scheme.

In chemical rooms or other corrosive environments, all materials in contact with room air shall be fully resistant to attack from the interior environment.

Part 3 – Execution

Install per manufacturer’s recommendations.

Louver assembly shall be set flush with the wall exterior

Operate all moving parts prior to installation. Any non-functional or binding parts shall be repaired or replaced prior to installation. Install so that blade linkages are accessible after installation to permit service and lubrication without requiring removal of wallboard or other structures.

8.91.13 Motor Actuated Louver/Dampers:

Part 2 – Products

Components

If automatic controlled operation, blades shall be adjustable from fully open to fully closed via a 120VAC motor actuator sized appropriately to operate the damper fully. Blades shall seal with neoprene or vinyl seals. Blades shall pivot on bronze or nylon bushings, or steel bearings. Contractor shall verify compatibility of damper to actuator. Motor actuator if any, shall be side mounted, out of the air stream. Motor actuator shall be located no lower than 6-inches above floor level. Provide disconnect switch for each unit (where applicable).

8.91.19 Fixed Louver

Part 1 – General

Provide fixed louver(s) as shown on the Plans.

Part 2 – Products

Components

Louver shall include channel frame mounted to the inside face of the wall.

Height and width of louver and damper shall be as shown on the Plans. Depth of louver, filter, and screen assembly shall be set flush with the wall exterior and any intrusion into the interior wall supported by the frame.
Division 9

Finishes – This Division Not Used
Division 10
Specialties

10.00 GENERAL

This division covers that work necessary for fabricating and installing all furnishings and accessories as described in these specifications and as shown on the Plans.

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

10.05 Common Work for Specialties

Part 1 - General

Submittals

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

- Equipment Signs
- Pipe Markings
- Danger Signs

*10.10 INFORMATION SPECIALTIES

10.14 Signs and Labels

10.14.1 Common Work for Signs and Labels

Part 2 - Products

Materials

Unless otherwise specified, text shall be white on a background color shown below.

<table>
<thead>
<tr>
<th>Purpose</th>
<th>Plate Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>General</td>
<td>Black</td>
</tr>
<tr>
<td>Warning</td>
<td>Red</td>
</tr>
<tr>
<td>Electrical</td>
<td>Black</td>
</tr>
<tr>
<td>Domestic Water</td>
<td>Blue</td>
</tr>
<tr>
<td>Raw Water</td>
<td>Purple</td>
</tr>
<tr>
<td>Waste Water</td>
<td>Green</td>
</tr>
<tr>
<td>Chemical</td>
<td>Orange or Brown</td>
</tr>
</tbody>
</table>
Part 3 - Execution

Installation

Install signs/markers directly on the devices in a location that does not interfere with the device operation or maintenance. If the device is too small or otherwise impractical to mount marker, locate marker as close as possible to the device on an adjacent surface.

Label all unburied pipe with fluid type and flow direction.

Provide signs for all equipment, vessels, and tanks. For equipment with multiple components, provide a sign for each major component. Provide and mount, as directed, equipment signs for the following:

1. Pumps and equipment
2. Pipes and Valves
3. Gauges, meter, and other measurement devices
4. Level and pressure devices
5. Electrical panels and disconnects
6. Other equipment and piping as directed

10.14.2 Equipment Signs

Part 2 - Products

Materials

Equipment signs shall be plastic-laminated 1-inch high, by required length, by ⅛-inch thick, with ½-inch high letters in N-2 Standard Gothic characters.

10.14.3 Pipe Markers

Part 2 - Products

Materials

Pipe markers shall be fabricated from outdoor grade acrylic plastic, and equal to Seton Setmark Type SNA pipe markers. Markers shall conform to standards for pipe and conduit identification (ANSI A13.1-1981).

10.14.4 Danger Signs

Part 1 - General

Summary

The Contractor shall provide danger signs per the schedule(s) on the Plans.
Part 2 - Products

Manufacturers
Danger signs shall be Seton Identification Products or approved equal. When stated on the Plans, provide specified model number or approved equal.

Components
Hazardous Materials signs shown on the Plans to comply with National Fire Protection Association standard 704 (NFPA 704) shall be corrosion resistant for indoor installation and corrosion and UV resistant for outdoor installation.

Chemical identification and “Danger Hazardous Chemical” signs shall be corrosion resistant. Signs mounted to tanks or equipment may be adhesive type.

Dimensions of sign(s) shall be as stated on the Plans.

Part 3 - Execution

Installation
Mount signs securely in locations shown on the Plans.

10.14.8 Electrical and Control Equipment

Part 2 - Products

Materials
Name plates and service legends shall be phenolic-engraved, rigid, laminated plastic type with adhesive back. Letter height shall be $\frac{5}{16}$-inch unless specified otherwise on the Plans. Labeling shall clearly identify the associate component. Color shall be black background with white letters.

Tags shall be securely attached. Adhesive backed tags shall also have at least two brass screws for positive fastening.

Part 3 – Execution

Installation
Provide engraved nameplates indicating load served, voltage, and phase for every circuit breaker, panel board, switchboard, motor control center, motor starter, disconnect switch, and fused switch.

All components provided under this specification, both field- and panel-mounted, shall be provided with permanently-mounted nametags. The Engineer shall have complete control over the hardware to be labeled and the labeling provided. Provide labels as directed.

Provide a name tag for each piece of equipment and for each circuit and/or control device associated with the equipment.

Provide a nameplate for each control center unit door.
Warning nameplates shall be provided on all panels and equipment which contain multiple power sources which may have energized circuits with the main disconnecting means in the off position. Lettering shall be white on red background.

10.45.3 Safety Clothing and Equipment

Part 2 – Products

Components

Safety clothing and equipment shall be equivalent to the following products listed.

<table>
<thead>
<tr>
<th>Item</th>
<th>Qty.</th>
<th>Model No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>PVC Blend/Polyester Acid Protective Jackets with Hoods</td>
<td>2</td>
<td>Lab Safety Supply No. 7A-31805, Sizes: 2-XL</td>
</tr>
<tr>
<td>PVC Blend/Polyester Acid Protective Bib Overalls</td>
<td>2</td>
<td>Lab Safety Supply No. 7A-4250, Sizes: 1-L, 1-XL</td>
</tr>
<tr>
<td>Double Matrix Face Shield</td>
<td>2</td>
<td>Lab Safety Supply No. 7A-11618</td>
</tr>
<tr>
<td>16&quot; Overboot (pair)</td>
<td>2</td>
<td>Lab Safety Supply No. 7A-5571, Sizes: 1-10, 1-12</td>
</tr>
<tr>
<td>Chemical Resistant Rubber Gloves</td>
<td>2</td>
<td>Sizes: L</td>
</tr>
<tr>
<td>Splash Resistant Safety Goggles</td>
<td>2</td>
<td>Lab Safety Supply No. 144062</td>
</tr>
</tbody>
</table>

PVC Blend/Polyester Acid Protective Garments

Fabric shall be PVC on polyester, flame retardant, and double-coated to withstand industrial acids, chemicals and caustics. Hardware shall be hidden and jacket shall have non-conductive snaps, storm-fly front, tapered sleeves and dielectric sealed seams. Hood shall have an adjustable drawstring for extra protection and hood shall be large enough to wear with a hard hat. Bib overall shall have plain front and elastic suspender straps. All fabric shall be 11.5 oz. per square yard.

Double Matrix Face Shield

Face shield shall have translucent polycarbonate crown and shall shield top of head and let in light. Ratchet suspension system shall allow adjustment for different head sizes. Face shield shall have swivel-locking window attachment, absorptive leatherette sweatband and wraparound window. The double matrix mask shall guard both the face and neck from flying particles and chemical splash. Includes all the features of the Matrix, plus a chin guard for added protection and full-vision wraparound acetate window. Face shield shall comply with ANSI Z87.1-2003 and shall be Safety Equipment Institute (SEI) certified.

Overboots

Overboots shall be one-piece, black molded vinyl, and 100 percent waterproof. Boots shall have three-position snap closures and anti-skid treads.
Chemical Resistant Rubber Gloves
Gloves shall be chemically resistant to acids, salts, caustics, alcohols, and detergents. They shall be 100 percent natural rubber, 18 Mil, with embossed tractor tread grip for handling wet or dry objects, 100 percent cotton flock lining, and 12 inches long. Gloves shall comply with 21 CFR, 170-199.

Splash Resistant Safety Glasses
One-piece contoured design, polycarbonate lenses, scratch resistant.
11.00 GENERAL

This division covers that work necessary for providing and installing all equipment as described in these specifications and as shown on the Plans.

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

The Bidder shall reference Division 1.33.2 regarding substitutes and “or-equals”.

The Plans were based on the first named equipment manufacturer within these specifications (either A or 1). To the extent possible, consideration was given during the design in order to accommodate the other named manufacturer(s). However, differences may exist between the manufactured units which may require changes to the Plans. The Bidder shall be responsible for identifying these differences and shall include in their bid the cost of all additional engineering and construction changes that may be required.

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

It is the Owner’s intention that the equipment provided under this contract will be installed by a general contractor. Throughout these specifications, the terms Contractor, Bidder, Manufacturer, and Manufacturer Representative are used to describe the services that are to be provided by the bidder for this contract. The bidder shall be required to coordinate and provide all work and materials as required for a complete and fully functional system.

11.05 Common Work for Equipment

Part 1 - General

Description

The Bidder shall provide all tools, supplies, materials, equipment and all labor necessary for the furnishing, testing and operation of equipment and appurtenant work, complete and operable, all in accordance with the requirements of the Contract Documents.

The provisions of this section shall apply to all equipment specified and where referred to, except where otherwise specified or shown.

Related Sections

- Division 1.33 Submittal Requirements
- Division 1.81 Seismic Restraint Requirements
Referenced Specifications, Codes and Standards

All equipment, products and their installation shall be in accordance with the following standards, as applicable and as specified in each section of these specifications. Except as otherwise indicated, the current editions of the following apply to the Work of this section.

1. American National Standards Institute (ANSI)
2. American Public Health Association (APHA)
3. Association of Rotational Molders (ARM)
4. American Society for Quality Control (ASQC)
5. American Society of Mechanical Engineers (ASME)
6. American Society for Testing Materials (ASTM)
7. American Water Works Association (AWWA)
8. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE)
9. American Welding Society (AWS)
10. The Chlorine Institute (CI)
11. Confinement of Substances Hazardous to Health (COSHH)
12. Institute of Electrical and Electronics Engineers (IEEE)
13. International Standards Organization (ISO)
14. National Electrical Code (NEC)
15. National Electrical Manufacturers Association (NEMA)
16. National Institute of Occupational Safety & Health (NIOSH)
17. Occupational Safety and Health Administration (OSHA)
18. National Fire Protection Association (NFPA)
19. Uniform Fire Code (UFC)
21. Water Environment Federation (WEF)
22. Underwriters Laboratory (UL)
23. Oregon Occupational Safety and Health Division (OR-OSHA)
24. Manufacturer’s published recommendations and specifications.

Submittals

Submittal information shall be provided to the Owner for all equipment specified herein.
Quality Assurance

The Bidder shall demonstrate that all equipment meets the specified performance requirements. Bidder shall provide the services of an experienced, competent and authorized service representative of the manufacturer of each item of major equipment, who shall visit the project site to perform the following tasks.

1. Assist the Owner in the installation and testing of the equipment.
2. Inspect, check, adjust if necessary and approve the equipment installation.
3. Start-up and field-test the equipment for proper operation, efficiency, and capacity.
4. Perform necessary field adjustments during the test period until the equipment installation and operation are satisfactory to the Engineer.
5. Instruct the Owner’s personnel in the operation and maintenance of the equipment. Instruction shall include step-by-step trouble shooting procedures with all necessary test equipment.

The costs of all inspection, startup, testing, adjustment, and instruction work performed by said factory-trained representatives shall be borne by the Bidder. When available, the Owner’s operating personnel may provide assistance in the field testing.

Tolerances and clearances shall be as shown on the shop drawings and shall be closely adhered to. Machine work shall in all cases be of high-grade workmanship and finish, with due consideration to the special nature or function of the parts.

Unless otherwise noted, all equipment furnished shall have a record from the same manufacturer of at least 3 years successful, trouble-free operation in similar applications.

Part 2 - Products

General Requirements

Unless otherwise specified or shown, all welding shall be by the metal arc method or gas-shielded arc method as described in the American Welding Society’s “Welding Handbook” as supplemented by other pertinent standards of the AWS. Qualification of welders shall be in accordance with the AWS Standards governing same.

In assembly and during welding, the component parts shall be adequately clamped, supported, and restrained to minimize distortion and for control of dimensions. Weld reinforcement shall be as specified by the AWS code. Upon completion of welding, all weld splatter, flux, slag, and burrs left by attachments shall be removed. Welds shall be repaired to produce a workmanlike appearance with uniform weld contours and dimensions. All sharp corners of material to be painted or coated shall be ground to a minimum of $\frac{1}{32}$-inch on the flat.

All equipment shall be painted or coated in accordance with these specifications, unless otherwise indicated. Non-ferrous metal and corrosion-resisting steel surfaces shall be coated with grease or lubricating oil. Coated surfaces shall be protected from abrasion or other damage during handling, testing, storing, assembly, and shipping.
All equipment shall be boxed, crated, or otherwise protected from damage and moisture during shipment, handling, and storage. All equipment shall be protected from exposure to corrosion and shall be kept thoroughly dry at all times.

Each item of equipment shipped shall have a legible identifying mark corresponding to the equipment number shown or specified for the particular item.

All equipment subject to vibration shall be provided with restrained spring type vibration isolators or pads per manufacturer’s written recommendations.

Shop fabrication shall be performed in accordance with the Specifications and the Engineer-reviewed shop drawings.

**Equipment Supports and Foundations**

All equipment supports, anchors, and restraint shall be adequately designed for static, dynamic, wind, and seismic loads. The design horizontal seismic force shall be the greater of that noted in the general structural notes or as required by the governing building code (10 percent of gravity minimum).

Equipment foundations shall be as per manufacturer’s written recommendations. All equipment shall be mounted as shown on the manufacturer’s standard details, unless otherwise shown or specified.

Shop drawings submitted to the Engineer for review shall include calculations showing equipment anchorage forces and the capacities of the anchorage elements to be provided by the Owner.

**Pipe Hangers, Supports, and Guides**

Piping systems, including connections to equipment, shall be properly supported, anchored, and guided to avoid stresses and loads on equipment flanges and equipment, and to prevent deflection of piping systems under operating and seismic conditions. Supports shall comply with ANSI/ASME B31.1, except as otherwise indicated.

Size hanger rods, supports, clamps, anchors, brackets, and guides in accordance with ANSI/MSS SP 58 and SP 69.

Support plumbing drainage and vents in accordance with the Uniform Plumbing Code.

All pipe support and hanger materials shall be suitable for the intended service environment. Materials that will be submerged or located within a corrosive environment (i.e. chemical room) shall be stainless steel.

**Chemical Piping Systems**

All pipe, fittings, valves, and accessories shall be rated for the applicable working and testing pressures as specified herein. Unless otherwise noted on the Plans or specified herein, all valves, fittings, and pipe for the chemical feed systems shall be as follows:

<table>
<thead>
<tr>
<th>Chemical</th>
<th>Plastics</th>
<th>Metals</th>
<th>Elastomers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sodium Hypochlorite:</td>
<td>CPVC</td>
<td>Titanium (where available)</td>
<td>Viton</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hastelloy C (elsewhere)</td>
<td></td>
</tr>
</tbody>
</table>

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The Bidder shall verify the suitability of the specified materials prior to bidding and submittals. Any discrepancies shall immediately be brought to the attention of the Engineer. Where discrepancies are noted, the Bidder shall assume that the more corrosion resistant material shall be used.

All piping, fittings, and valving materials shall be chlorinated polyvinyl chloride (CPVC) material and shall conform to ASTM D-1784, Type 1, Grade 1, with 2,000 psi design stress. All process and drain piping shall be Schedule 80, vent piping may be Schedule 40 or Schedule 80 in accordance with ASTM D-1785.

All valves shall be flanged or true union. Ball valves used in hypochlorite services shall be for Bleach service with an energized seat that will concurrently provide automatic adjustment for wear and leak-free service at the lower pressure port, and with a ball containing an adequate vent to the higher pressure port.

**Flanges and Pipe Threads**

All flanges on equipment and appurtenances provided under this section shall conform to ANSI B16.1, Class 125 or B16.5, Class 150, unless otherwise shown. All pipe threads shall be in accordance with ANSI/ASME B1.20.1.

**Flexible Connectors**

Flexible connectors shall be installed in all piping connections to tanks, engines, blowers, compressors, and other vibrating equipment. All materials used shall be recommended by the manufacturer for the intended process and/or chemical service application. Flexible connectors shall be configured with flanged connection and limiting rods, unless otherwise noted.

**Nameplates**

Equipment nameplates of stainless steel shall be engraved or stamped and fastened to the equipment in an accessible location. Nameplates shall contain the manufacturer’s name, model, serial number, size, characteristics, and appropriate data describing the machine performance ratings.

**Part 3 - Execution**

**Pre-Packaged Equipment**

When any system is furnished as pre-packaged equipment, the Contractor shall coordinate all necessary space and structural requirements, clearances, utility connections, signals, and outputs with his subcontractors and suppliers.

If the packaged system has any additional features other than specified, the Contractor shall coordinate such features with the Engineer and furnish all material and labor necessary for a complete installation, as required by the manufacturer, at no additional cost to the Owner.

**Piping Systems**

Piping systems shall be installed in accordance with applicable standards and with the highest quality workmanship. For CPVC piping that is installed in exposed locations that will not be painted, primer and glue must be applied carefully and not allowed to run. Areas where
primer/glue has run more than ¼-inch past the joint will be cleaned, painted or replaced by the Contractor at the discretion of the Owner.

11.50 SCIENTIFIC EQUIPMENT

11.53 Lab Equipment

11.53.34 Safety Station with Eye/Face Wash

Part 1 – General

Performance Requirement

Unit shall meet or exceed ANSI Z358.1, latest edition.

Warranty

Unit shall come with a full 2-year warranty.

Part 2 – Product

Manufacturer

Interior unit shall be Guardian Equipment Model G1993, or approved equal.

Exterior unit shall be Guardian Equipment Model GFR3100, or approved equal.

Product

Interior Unit: Combination eye wash/shower safety station unit shall be corrosion resistant with ABS plastic shower head, ABS plastic bowl, cast aluminum powder coated flag handle, PVC floor flange, 2-inch IPS Schedule 80 PVC pipe and fittings, 1-inch IPS and ½-inch IPS U.S. made PVC coated brass stay open ball valves, and polished stainless steel pull rod. Unit shall have (2) polypropylene spray heads with integral “flip-top” dust covers, filters, and 3.2 GPM flow control orifices mounted on a PVC coated brass head assembly. Unit shall include ANSI compliant sign.

Exterior Unit: Combination eye wash/shower safety station unit shall be electric heat-traced with UW-resistant ABS plastic with polyethylene foam insulation, corrosion resistant with ABS plastic shower head, 1” IPS stay open shower ball valve, freeze-resistant spray head assembly with float-off dust covers, ½” IPS three way self-draining stay open eyewash ball valve, schedule 40 galvanized steel pipe and fittings, and polished stainless steel pull rod. Unit shall include ANSI compliant sign.

Accessories

Provide one (1) thermostatic mixing valve to control and maintain the temperature of the water to the emergency eye/face wash safety station. Unit shall be self-contained and include a thermostatic water mixing valve, a dial thermometer on the outlet, union angle checkstops, wall mounting bracket, piping, and fittings factory assembled and tested, top or bottom inlets and top outlet, unit set for 85 degrees Fahrenheit (29 degrees Celsius) and a maximum temperature of 90 degrees Fahrenheit (32 degrees Celsius). Unit must be able to be set to the correct temperature for the specific contaminant but must be locked in place to prevent changing of the temperature by accident. Unit shall be able to flow a minimum flow of
20 GPM (76 l/min) at 30 PSI (2.1 Bar). Thermostatic mixing valve shall be Leonard Valve Model TM-600, or approved equal.

Provide single pole, double throw flow switch for use in monitoring the water supply line upstream of the emergency shower. The switch shall be integrated with the plant’s telemetry and SCADA system to provide alarm notification in the event that the unit is activated.

**Part 3 – Execution**

Install safety station and mixing valve in the locations shown on the Plans and per the manufacturer’s recommendations and all application standards.

**11.60 TREATMENT EQUIPMENT**

**11.62.56.19 Transfer Pumps**

**Part 1 - General**

**Performance Requirements**

The pumps shall have a minimum capacity of 5 gpm and a maximum capacity of 17.1 gpm.

**Spare Parts**

Provide one shelf spare transfer pump.

**Part 2 - Products**

**Manufacturer**

Unit shall be Iwaki America Model MD-55Y, or approved equal.

**Materials**

Transfer pump shall be a magnetically coupled centrifugal pump. Pump shall be equipped with a twin bearing system to handle thrust loads and hollow rotating / internal cooling circuit to reduce bearing temperature. Pump shall be constructed out of non-corrosive material and be rated to pump sodium hypochlorite at a 12.5 percent concentration.

**11.64 Water Treatment Chemical Systems Equipment**

**11.64.13.05 Common Work for Chemical Feed Equipment**

**Part 1 – General**

Metering pump(s) shall be provided for feeding chemical(s) at the feed rate(s) and operating pressure(s) as indicated in Division 11.64.13.06. Valveboard shall be of quality construction for piping, valves, fittings, and appurtenances per Division 15.

**Related Sections**

Division 1.75.5 – Treatment System Testing
Division 1.82 – Pressure Ratings
Division 15.61 – Pressure Gauges
Division 15.80 – Chemical Piping Systems

Division 17 – Mechanical

Quality Assurance

1. All equipment provided under this Section shall be obtained from a single supplier or manufacturer who, with the manufacturer's authorized sales and service representative, shall assume full responsibility for the completeness and proper operation of the chemical feed system.

2. To ensure quality and unit responsibility, the pump and valveboard must be assembled and pressure tested by the chemical metering pump manufacturer at his facility and shall be a standard and regularly marketed product of that manufacturer. The manufacturer must have a physical plant, technical and design staff, and fabricating personnel to complete the work specified. Pump and valveboard assembled by a second party fabricator, integrator, or Contractor shall not be acceptable.

3. All valveboard assemblies are required to be shop fabricated by an experienced valveboard assembler and chemical feed equipment supplier. Fabricator shall be an expert at the construction of chemical feed systems and shall submit references for at least 25 chemical treatment projects within the last 10 years of similar nature to this project. Field fabrication or shop fabrication by inexperienced personnel will not be allowed.

4. Shop Tests:
   a. Tests shall be conducted on the actual pump(s) and valveboard(s) being provided for the project. All tests must be completed and documentation supporting the testing must be submitted and accepted by the Engineer before shipment.
   b. All pumps shall be tested to Section 1.82 and documentation of testing shall be provided to the Engineer for review. The test can be performed with water. The system shall be operated throughout the entire operating range of the pumps.
   c. All piping shall be hydrostatically tested in accordance with Section 1.82 without leakage. Documented testing results shall be provided to the Engineer.

5. Field Tests:
   a. The pump and valveboard shall be pressure tested with water with no visible leaks.
   b. The pump and valveboard must then be pressure tested with chemical solution and strength that the valveboard is intended for. No visible leaks are considered acceptable.

6. See Division 1 and 15 for additional testing, startup, and operational requirements and information.

Submittals

1. Provide product information on all pipe, fittings, valves, accessories, etc. to be used on the valveboard and chemical feed system per Section 15.80.

2. Provide submittal data verifying that the valveboard and chemical feed system is capable of delivering chemicals into a water pipeline that has a working pressure as listed herein.
3. Valveboard submittals shall include a dimensional shop drawing of the valveboard layout and identify all headlosses from the metering pump to the injection point.

4. Metering pump submittals shall include:
   a. Dimensional shop drawings;
   b. Performance curves showing proper operation at specified upper and lower flow rates and pressures;
   c. Operating, maintenance, programming, and wiring instructions/manuals.

**Warranty**

All equipment shall be provided with 2-year warranty unless otherwise noted. Warranty shall cover parts, labor, and equipment necessary to repair failed units or to replace the pump(s). Warranty shall apply to defects in materials or assembly of the pump and in installation, and shall commence after project acceptance as determined by the Owner in writing.

**Spare Parts**

Provide one spare parts kit for each metering pump.

**Nameplate**

Each metering pump shall be equipped with a nameplate indicating capacity, motor horsepower, speed, electrical characteristics, manufacturer, model number, and serial number.

**Coordination**

Coordinate the installation of all items specified herein and required to ensure the complete and proper interfacing of all components and systems.

**Part 2 – Products**

All chemical feed equipment including, but not limited to, metering pump(s) and valveboards shall be provided per the Plans and as specified herein.

**Part 3 – Installation**

A manufacturer trained representative shall verify installation and correct operation prior to startup. The representative shall be present during testing, startup, operational demonstration, and provide training.

All materials and equipment shall be clean and free of oil, grease and/or chemical contaminations prior to installation.

1. Training: One full day of training shall be provided on-site to the operation staff after the equipment start-up and operational demonstration. Training will include review of the Operation and Maintenance manuals for each piece of equipment. See Division 1 for additional information.

2. Service: Factory trained direct or authorized service technician shall be available within 24 hours of notification.

Provide a manufacturer’s certificate showing the equipment has been satisfactorily installed, calibrated, and tested.
11.64.13.06 Schedule

Part 1 – General

The table below provides a summary of the hydraulic conditions that shall be met for each chemical.

<table>
<thead>
<tr>
<th>At Metering Pump</th>
<th>At Injection Point</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tag</td>
<td>Chemical</td>
</tr>
<tr>
<td>P-106 &amp; P-108</td>
<td>12.5% Sodium Hypochlorite</td>
</tr>
<tr>
<td>P-107 &amp; P-109</td>
<td>12.5% Sodium Hypochlorite</td>
</tr>
</tbody>
</table>

The table below provides a summary of the metering pumps to be provided under this section.

<table>
<thead>
<tr>
<th>At Metering Pump</th>
<th>Pump Type and Specification</th>
<th>Pump Manufacturer</th>
<th>Feed Rate (gph)</th>
<th>Maximum Available Operating Pressure (psi)</th>
<th>Turndown</th>
</tr>
</thead>
<tbody>
<tr>
<td>P-106 &amp; P-108</td>
<td>Peristaltic 11.64.13.13</td>
<td>Watson Marlow qdos</td>
<td>0.001 - 15.85</td>
<td>100</td>
<td>10,000:1 min.</td>
</tr>
<tr>
<td>P-107 &amp; P-109</td>
<td>Peristaltic 11.64.13.13</td>
<td>Watson Marlow qdos</td>
<td>0.001 - 15.85</td>
<td>100</td>
<td>10,000:1 min.</td>
</tr>
</tbody>
</table>

11.64.13.11 Valveboard

Part 1 – General

The valveboard shall be specially designed, constructed, and installed for the service intended. The manufacturer or their authorized sales and service representative shall submit compatibility data to confirm the materials of construction are compatible with the chemical service intended.

Part 2 – Product

The simplex chemical metering system valveboard skid shall be per the Plans and contain the following items, at a minimum.
a. Polypropylene or polyethylene valveboard. The valveboard shall be fully framed with a clear cover that will protect operators and equipment from chemical exposure due to drips or valveboard piping failure.

b. Calibration column.

c. Pulsation dampener.

d. Pressure gauge with diaphragm seal.

e. Ball valve(s) and union(s).

f. Pressure relief valve.

g. Backpressure valve.

h. Wye strainer.

i. All piping, valves, gaskets, supports, hardware, wiring, and accessories necessary for a fully functioning system.

The valveboard piping shall be supported and offset from the valveboard using fiberglass Unistrut components.

Part 3 – Execution

The valveboard shall be factory and field pressure tested as specified herein and with the specified pumping unit.

11.64.13.13 Peristaltic Metering Pump

Part 1 – General

Performance Requirements

Peristaltic metering pump shall be capable of 24-hour continuous duty; shall be self-priming; and shall be capable of running dry without damage. Peristaltic metering pump shall be capable of operating in either direction of flow without output variation and at the rated maximum pressure. Suction lift shall be minimum 30 feet of water. Accuracy shall be +/- 0.5 percent of flow rate capacity with repeatability of +/- 0.5 percent.

Each pump shall have a maximum capacity and pressure rating as specified under Division 11.64.13.06 Schedule.

Submittals

Provide metering pump model, technical data, selected options, dimensional drawings, chemical compatibility, and power and signal wiring diagrams.

Provide warranty information and operations and maintenance (O&M) manual(s) prior to project completion.

Warranty

The peristaltic metering pump shall be warranted for a period of five (5) years from Owner approved installation on this project. The warranty shall include chemical damage to the pump head and roller assembly for a period of two (2) years from Owner written approval.
Spare Parts
Provide two (2) spare tubes and one (1) spare roller assembly for each metering pump provided.

Provide two (2) spare pump heads for each make/model of pump.

Nameplate
Each metering pump shall be equipped with a unique nameplate indicating capacity, motor horsepower, full speed rating, electrical characteristics, manufacturer, model number, and serial number.

Part 2 – Products
Manufacturers
Metering pumps shall be Qdos 60 peristaltic pump manufactured by Watson Marlow, or approved equal.

Tubing material and size shall be selected based on operating conditions, chemical compatibility, and maximum tubing life.

Components
The pump shall be certified to NSF Standard 61 and UL listed.

The metering pump shall be a positive displacement, peristaltic type tubing pump with a brushless variable speed motor. Drive system shall be factory installed and totally enclosed in the pump enclosure. Metering pump shall operate with a 110 VAC, single phase, 60 Hz power supply.

There shall be no valves, diaphragms, springs, or dynamic seals in the fluid path. Chemical shall contact the pump tubing assembly and connection fittings only.

Pump Head
Pump head shall be a single, unbroken track with a clear removable cover.

Squeeze rollers with encapsulated ball bearings shall be directly coupled to a one-piece thermoplastic rotor. Four (4) polymeric rollers shall be provided; two (2) squeeze rollers for tubing compression shall be located 180-degrees apart and two (2) guide rollers that do not compress the tubing shall be located 180-degrees apart. The roller diameters and occlusion gap shall be factory set to provide the optimum tubing compression; field adjustment shall not be required. Spring-loaded or hinged rollers shall not be used.

Rotor assembly shall be installed on a D-shaped, chrome plated motor shaft and removable without tools.

For tubing installation and removal, rotor assembly shall be rotated by the motor drive at 6 rpm maximum when the pump head cover is removed. Hand cranking of the rotor assembly shall not be required.

Pump head and tubing compression surface shall be corrosion resistant Valox thermoplastic.
The pump head cover shall be clear, polycarbonate thermoplastic with an integral ball bearing fitted to support the overhung load on the motor shaft. Cover shall include an embedded magnetic safety interlock which shall limit the motor rotation speed to 6 rpm when removed. Cover shall be positively secured to the pump head using a minimum of four thumb screws. Tools shall not be required to remove the pump head cover.

**Pump Tube Assembly**

Pump tubing shall be a product designed and intended for use with the metering pump and provided by the pump manufacturer. Tubing material shall be compatible with the liquid chemical being pumped.

Pump tube shall be assembled to connection fittings of PVDF material.

To prevent tubing misalignment and ensure accuracy, fittings shall insert into keyed slots located in the pump head and secured in place by the pump head cover.

**Tube Failure Detection**

A tube failure detection (TFD) system shall be included as part of the metering pump. TFD system sensors shall be wholly located in the pump head. Float type switches shall not be used. TFD system shall stop the pump within three (3) seconds of leak detection. To prevent false alarms due to rain, wash-down, condensation, etc., TFD system shall not trigger with water contact. Process fluid waste ports or leak drains shall not be provided.

**Motor**

Motor shall be a reversible, variable speed, brushless DC gear motor rated for continuous duty. Motor shall include overload protection and have a maximum gear motor rotation of 125 rpm.

**Pump Body Enclosure**

Enclosure shall be pressure cast aluminum with acidic liquid iron phosphate three-stage clean and coat pre-treatment and exterior grade corrosion resistant polyester polyurethane powder coat. Enclosure shall be rated for NEMA 4X (IP66).

A wiring compartment shall be provided for connection of input/output signal wires and alarm output loads to un-pluggable type terminal block connectors. Terminal board shall be positively secured to the rear of the pump housing by two polymeric screws and fully enclosed by the wiring compartment cover. The terminal board shall not be disturbed by the removal of the wiring compartment cover. Ribbon cables shall not be used in the wiring compartment. Conduit hubs, liquid-tight connectors, connector through holes and tapped holes shall be sized in U.S. inches.

**Control Circuitry**

All control circuitry shall be integral to the pump and capable of adjusting the pump motor speed from 0.001 percent to 100.0 percent in 0.001 percent increments less than 1 percent motor speed, in 0.01 percent increments between 1 percent and 10 percent motor speed, and in 0.1 percent increments greater than 10 percent motor speed (10,000:1 turndown ratio).

The pump output shall be capable of being manually controlled via front panel user touchpad controls.
The pump output shall be capable of being remotely control via 4-20 mA analog input. The input resolution shall be 0.01 of input value and capable of adjusting the pump motor speed from 0 percent to 100.0 percent motor speed in 0.1 percent increments. Four values shall be user configurable to define the low and high points on the output slope; a low input value, the required pump percentage of motor speed at the low input value, a high input value, and the required pump percentage of motor speed at the high input value.

The pump shall include an internal cycle timer capable of automatically cycling the pump on and off. The pumping total cycle time shall be adjustable from 1 to 999999.9 seconds. The pumping on time during the cycle shall be adjustable from 1 to 999999.9 seconds. The pump motor speed during the cycle shall be adjustable from 0 percent to 100.0 percent motor speed in 0.1 percent increments.

The pump shall be capable of dispensing upon demand. The dispensing shall be manually triggered by pressing the front panel start button or by inputting a contact closure. The dispensing volume shall be adjustable from 1 to 999999.9 milliliters. The pump motor speed during the dispensing cycle shall be adjustable from 0 percent to 100.0 percent motor speed in 0.1 percent increments.

Provide an 11-button front panel user touchpad control for stop/start, configuration menu access and navigation, operating mode selection, auto priming, display options selection, tube life data, and reverse direction.

Provide a multi-color VGA graphic LCD display for menu driven configuration settings, pump output value, service alerts, tube failure detection (TFD) system alarm status, remote input signal values, tubing life timer value. Display color shall be green when indicating normal operation, blue when in stand-by, and red to indicate an alarm condition exists.

Provide for remote stop/start pump via 6-30 VDC powered loop or non-powered contact closure loop.

Provide a user selectable 4-20mA output signal which is scalable and proportional to pump output volume.

Provide four (4) contact closure alarm outputs. Three (3) rated at 1A-115VAC, 0.8A-30VDC and one (1) rated at 6A-250VAC, 5A-30VDC. Each alarm output shall be assignable to monitor any of the following pump functions: TFD system, FVS system, motor run/stop, motor failed to respond to commands, motor is running in reverse, general alarm (TFD, FVS, and/or motor over current), input signal failure, output signal failure, remote/local control status, revolution counter (tube life) set-point, or monitor which of the nine different pump operating modes is currently active.

Provide a four-digit password protected configuration menu.

Provide a roller revolution counter display (tube life indicator) with user programmable alarm set-point value from 1 to 999,999,999 revolutions which can be assigned to any one of the four (4) contact closure alarm outputs.

Provide a user programmable maximum rpm set-point value from 0.1 to 100.0 RPM in 0.1 increments.
Provide a user adjustable response delay time from 0 to 999.9 seconds for the remote start/stop input and the four (4) contact closure alarm outputs to facilitate closed-loop applications.

Provide a power interruption pump restart option which is user programmable to either automatically restart or require a user re-start if AC main power is interrupted.

**Part 3 – Execution**

**Installation**

Install the metering pump, all tubing, tubing connections, all power and signal wiring, and power and signal connections per the manufacturer’s instructions.

**11.64.73 Storage Tanks**

**11.64.73.13 Chemical Storage Tank**

**Part 1 - General**

**Summary**

1. This specification covers upright, cylindrical, flat, and/or cone bottom tanks molded in one-piece seamless construction by rotational molding. The tanks are designed for above-ground, vertical installation and are capable of containing chemicals at atmospheric pressure. Included are requirements for materials, properties, design, construction, dimensions, tolerances, workmanship, and appearance. Tank capacities are from 375 gallons up to 16,500 gallons.

2. This specification does not cover the design of vessels intended for use at pressures above or below atmospheric conditions. It is also not for vessels intended for use with liquids heated above their flash points, temperatures above 130 degrees Fahrenheit.

**Work of this Section**

1. The work of this section includes providing Type I crosslink, high density polyethylene tanks with piping connections, ladders, seismic restraint, and accessories for chemical storage. Tank resin and accessories to be compatible with chemical being stored for this Contract.

2. The work also requires that one manufacturer accept responsibility for furnishing the work as indicated.

3. The work additionally requires that the manufacturer who accepts the indicated responsibilities shall manufacture the tank.

4. The installing contractor will coordinate the installation of all items specified herein and required to ensure the complete, and proper interfacing of all the components and systems.

**Related Sections**

Division 1.75.05 Treatment System Testing

Division 1.81 Seismic Restraint and Anchorage
References

Except as otherwise indicated, the current editions of the following apply to the work of this section.

1. American Society for Testing and Materials (ASTM) Standards
   a. ASTM D618  Conditioning Plastics and Electrical Insulating Materials for Testing
   b. ASTM D638  Tensile Properties of Plastics
   c. ASTM D746  Britleness Temperature of Plastics and Elastomers by Impact
   d. ASTM D790  Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
   e. ASTM D883  Definitions of Terms Relating to Plastics
   f. ASTM D1505  Density of Plastics by the Density-Gradient Technique
   g. ASTM D1525  Vicat Softening Temperature Plastics
   h. ASTM D1693  Environmental Stress-Cracking of Ethylene Plastics
   i. ASTM D1998  Standard Specification for Polyethylene Upright Storage Tanks
   j. ASTM D2837  Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials
   k. ASTM D3892  Practice for Packaging/Packing of Plastics
   l. ASTM F412  Definitions of Terms Relating the Plastic Piping Systems

2. Association of Rotational Molders (ARM) Standards
   a. Low Temperature Impact Resistance (Falling Dart Test Procedure)

3. National Sanitation Foundation (NSF)/American National Standards Institute (ANSI)
   a. ANSI 61 American Waterworks Association – Drinking Water System Components

4. American National Standards Institute (ANSI) Standards
   a. ANSI B-16.5 Pipe Flanges and Flanged Fittings

5. Occupational Safety and Health Administration (OSHA) Standards
   a. 29 CFR 1926.152 Occupational Safety and Health Administration, Flammable and Combustible Liquids

   a. 2014 Oregon Structural Specialty Code

Design and Performance Standards

1. The minimum required wall thickness of the cylindrical shell at any fluid level shall be determined by the following equation, but shall not be less than 0.187 inches thick.
   1. \( T = \frac{P \times \text{O.D.}}{2 \times \text{SD}} = 0.433 \times \text{S.G.} \times \text{H} \times \text{O.D.} / 2 \times \text{SD} \)
   2. \( T \) = wall thickness
   3. \( \text{SD} \) = hydrostatic design stress, PSI
   4. \( P \) = pressure (.433 x S.G. x H), PSI
5. \( H \) = fluid head, ft.
6. S.G. = specific gravity, g/cm\(^3\)
7. O.D. = outside diameter, in.

b. The hydrostatic design stress shall be determined by multiplying the hydrostatic design basis, determined by ASTM D2837 using rotationally molded samples, with a service factor selected for the application. The hydrostatic design stress is 600 PSI at 73 degrees Fahrenheit for Type I and 550 PSI for Type II materials.

c. The hydrostatic design stress shall be derated for service above 100 degrees Fahrenheit and for mechanical loading of the tank.

d. The standard design specific gravity shall be 1.9.

2. The minimum required wall thickness for the cylinder straight shell must be sufficient to support its own weight in an upright position without any external support. Flat areas shall be provided to allow locating large fittings on the cylinder straight shell.

3. The top head must be integrally molded with the cylinder shell. The minimum thickness of the top head shall be equal to the top of the straight wall. The top head of tanks with 2,000 or more gallons of capacity shall be designed to provide a minimum of 1,300 square inches of flat area for fitting locations.

4. Tanks with 2,000 or more gallons of capacity shall have a minimum of three lifting lugs. The lifting lugs shall be designed to allow erection of an empty tank.

5. The tank shall be designed to provide a minimum of four tie-down lugs integrally molded into the top head. The tie-down lugs shall be designed to allow tank retention in wind and seismic loading situations without tank damage.

**Submittals**

1. Factory shop drawing that includes overall tank dimensions; manufacturer part number; fitting and accessory orientation; fitting, gasket and bolt style and size; tank material and specific gravity; and tank color. Provide details on inlet and outlet fittings, manways, flexible connections and vents.

2. Seismic support structure and anchoring system details, seismic and engineering calculations with finite analysis stamped by a licensed engineer in the state of the installation.
   a. Wall thickness. Hoop stress shall be calculated using 600 psi @ 100 degrees F.
   b. Tank restraint system. Show seismic and wind criteria.

3. Tank and Fitting Material Data Sheets and statement by the manufacturer indicating compliance with the materials requirements.
   a. Resin manufacturer data sheet
   b. Fitting material
   c. Gasket style and material
   d. Bolt material
4. Chemical compatibility sheet to include chemical, concentration, and storage temperature.
5. Manufacturer’s guidelines for use and installation.
6. Manufacturer’s tank unloading and storage procedures.
7. Quality assurance inspection report to include the following.
   a. Tank description (nominal gallonage and diameter, tank material, specific gravity and hoop stress design, and color).
   b. Review of wall thickness audit.
   c. Low temperature impact test results.
   d. Ultrasonic tank thickness test results.
   e. Hydrostatic test results.
   f. Fitting placement sign-off.
   g. Accessory inspection.
   h. Tank visual inspection.
10. Foam insulation data sheets as required.
11. Factory Test Report
   a. Material, specific gravity rating at 600 psi @ 100 degrees F design hoop stress
   b. Wall thickness verification
   c. Fitting placement verification
   d. Visual inspection
   e. Impact test
   f. Hydrostatic Test

**Quality Assurance**

1. All tanks shall be undergo a Low Temperature Impact Test per ASTM D1998. Test specimens < \( \frac{1}{2} \) -inch thickness shall be tested at 100 ft.-lb. Test specimens > \( \frac{1}{2} \) -inch thickness shall be tested at 200 ft.-lb.

2. All tanks 2,000 gallons or larger shall be measured for tank wall thickness at 6-inch increments up the straight side of the vessel, at 0 degrees, 90 degrees, 180 degrees, and 270 degrees around the tank circumference with 0 degrees being the tank manway and going counter-clockwise per ANSI standard drafting specifications. All tanks shall meet design thickness requirements and tolerances. A full set of testing results must be provided with the tanks shipment.

3. All tanks shall undergo a hydrostatic water test shall consist of filling the tank to brim full capacity for a minimum of four hours and conducting a visual inspection for leaks.

4. The finished tank wall shall be visually inspected and certified to be free, as commercially practicable, of visual defects such as foreign inclusions, air bubbles, pinholes, pimples, crazing, cracking, and delaminations that will impair the serviceability of the vessel. Fine
bubbles are acceptable with Type II tanks to the degree in which they do not interfere with proper fusion of the resin melt. All cut edges where openings are cut into the tanks shall be trimmed smooth.

5. Tanks shall be manufactured from materials compatible to contain the intended chemical at the storage temperature.

**Delivery, Storage and Handling**

**Project Conditions**

**Warranty**

The tank shall be warranted for three (3) years to be free of defects in material and workmanship from the date of project acceptance as determined by the Owner in writing.

**Part 2 - Products**

**Manufacturers**

Chemical storage tanks shall be as constructed by PolyProcessing Company, (866) 590-6845 or [www.polyprocessing.com](http://www.polyprocessing.com), or approved equal.

**Components**

**Tanks**

1) Materials: Polyethylene shall be Type I crosslink high density-type meeting or exceeding the following.

<table>
<thead>
<tr>
<th>Property</th>
<th>ASTM Method</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Density (gm/cc)</td>
<td>D1505</td>
<td>0.938 to 0.946</td>
</tr>
<tr>
<td>Tensile strength at yield (psi minimum)</td>
<td>D638</td>
<td>2,800</td>
</tr>
<tr>
<td>Elongation at break (min percent)</td>
<td>D638</td>
<td>700</td>
</tr>
<tr>
<td>ESCR, 100% Igepal, Cond A, F50</td>
<td>D1693</td>
<td>&gt; 1,000</td>
</tr>
<tr>
<td>ESCR, 10% Igepal, Cond A, F50</td>
<td>D1693</td>
<td>&gt;1000</td>
</tr>
<tr>
<td>Vicat softening temperature (deg.F)</td>
<td>D1525</td>
<td>250</td>
</tr>
<tr>
<td>Flexural modulus (psi)</td>
<td>D790</td>
<td>102,000</td>
</tr>
</tbody>
</table>

2) Operating Conditions: Chemical storage tanks provided under this section shall be suitable for the following operating conditions.

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemical stored</td>
<td>Sodium Hypochlorite (NaOCl)</td>
</tr>
<tr>
<td>Concentration, %</td>
<td>≤15%</td>
</tr>
<tr>
<td>Unit weight, lb/gal</td>
<td>8.34 for 0.8% NaOCl</td>
</tr>
<tr>
<td></td>
<td>10 for 12.5% NaOCl</td>
</tr>
<tr>
<td>Design specific gravity</td>
<td>1.9</td>
</tr>
</tbody>
</table>
Solution pH  >11
Maximum fluid temperature, deg.F  110°F
Working temperature, deg.F  80°F
Minimum ambient air temperature, deg.F  25°F (outdoor tank), 45°F (indoor tank)

3) Schedule: The following tanks shall be provided under this section. The manufacturer shall refer to the Plans for additional details regarding installation and operations conditions. The manufacturer shall confirm and provide documentation showing that all storage tanks supplied can be fit and installed within the existing building.

Description: Double Walled Sodium Hypochlorite Bulk Storage Tank*

Quantity  1
Capacity  6,650 gallon minimum
Chemical  12.5% Sodium Hypochlorite
Nominal diameter, in.  122, must fit and be seismically restrained on existing outdoor pad
Height Limitation  See Plans
Storage Conditions and Color  Outdoor, High UV Exposure, Black Color with UV Inhibitors with Complete Insulation
Access Requirements:  Minimum 24" Sealed Manway with pneumatic air surge protection cover (Poly Processing Safe-surge or equal) and Ladder
Connection Requirements:  See Plans
  2" Sodium Hypochlorite Inlet
  3" Combined Sodium Hypochlorite Outlet & Drain
  6" Air Vent Outlet
  3" Overflow
  Ultrasonic Level Transmitter
  Reverse Liquid Level Gauge
  Vibrating Fork Secondary Containment Liquid Level Switch

*Storage tank shall be double walled construction for secondary containment of bulk 12.5 percent sodium hypochlorite.

Description: Double Walled Sodium Hypochlorite Day Storage Tank*

Quantity  2
Capacity  405 gallon minimum

*Closed, See Plans
  2" Drum Pump Outlet
  3" Drum Pump Drain
  4" Air Vents
  2" Water Inlet
  6" Drum Spout Outlet
  3" Drum Spout Drain
  Ultrasonic Level Transmitter
  Ultrasonic Level Transmitter
  Reverse Liquid Level Gauge
  Reverse Liquid Level Gauge
  Vibrating Fork Secondary Containment Liquid Level Switch
  Vibrating Fork Secondary Containment Liquid Level Switch
  2" Air Inlet
  6" Air Outlet
  6" Water Inlet
  6" Water Drain
  2" Water Inlet
  6" Water Drain

*Storage tank shall be double walled construction for secondary containment of bulk 12.5 percent sodium hypochlorite.
<table>
<thead>
<tr>
<th>Chemical</th>
<th>12.5% Sodium Hypochlorite</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal diameter, in.</td>
<td>48, both tanks with all accessories must fit on existing indoor concrete pad</td>
</tr>
<tr>
<td>Height Limitation</td>
<td>72 inches</td>
</tr>
<tr>
<td>Storage Conditions and Color</td>
<td>Indoor, Low UV Exposure, Natural Color</td>
</tr>
<tr>
<td>Access Requirements:</td>
<td>Minimum 7&quot; Standard Cover</td>
</tr>
<tr>
<td>Connection Requirements:</td>
<td>See Plans</td>
</tr>
<tr>
<td></td>
<td>2&quot; 12.5% Sodium Hypochlorite Inlet</td>
</tr>
<tr>
<td></td>
<td>2&quot; Combined Sodium Hypochlorite Outlet &amp; Drain</td>
</tr>
<tr>
<td></td>
<td>3&quot; Air Vent Outlet</td>
</tr>
<tr>
<td></td>
<td>2&quot; Overflow</td>
</tr>
<tr>
<td></td>
<td>Ultrasonic Level Transmitter</td>
</tr>
</tbody>
</table>

*Storage tank shall be double walled construction for secondary containment of bulk 12.5 percent sodium hypochlorite.

**Tank Fittings**

1. Threaded bulkhead fittings shall be provided for fittings located above the maximum liquid level or where specified on the plan. Self-aligning threaded bulkhead fittings shall be provided where fittings are located on tank dome or other curved surface, or as specified on the Plans. Fittings must be placed away from tank knuckle radius' and flange lines. The bulkhead fittings shall be constructed of PVC. Gaskets shall be a minimum of ¼-inch thickness material suitable for the chemical stored.

2. Bolted double flange fittings are required for fittings located below the maximum liquid level or where specified on the plan. Fittings must be placed away from tank knuckle radius' and flange lines. Bolted double flange fittings provide the best strength and sealing characteristics of any tank fitting available.

   a. The bolted flange fitting shall be constructed with one 150 pound flange, one 150 pound flange gaskets, and the correct number and size of all-thread bolts for the flange specified by the flange manufacturer. The flanges shall be constructed of PVC Type I, Grade I. Standard orientation of bolted double flange fittings shall have bolt holes straddling the principal centerline of the tank in accordance with ANSI/ASME B-16.5, unless otherwise specified. Gaskets shall be a minimum of ¼-inch thickness material suitable for the chemical stored. There shall be a minimum of four full thread bolts. The bolts will have bolt heads encapsulated in elastomer material. The encapsulated bolt shall be designed to prevent metal exposure to the liquid in the tank and prevent bolt rotation during installation. The elastomeric encapsulation shall fully cover the bolt head and a minimum of ¼-inch of the threads closest to the bolt head. The polyethylene shall be color coded to distinguish bolt material. Each encapsulated bolt shall have a gasket to provide a sealing surface.
against the inner flange. The bolt material shall be titanium for sodium hypochlorite applications; 316 stainless steel for sodium hydroxide (caustic) and all other chemical applications.

3. For sodium hypochlorite and sulfuric acid storage, Bolted One-Piece Sure Seal (B.O.S.S.), double flange fittings constructed of virgin polyethylene shall be supplied. Bolts will be welded to a common backing ring and encapsulated with polyethylene preventing fluid contact with the metal material. Flange will have one full face gasket to provide a sealing surface against inside tank wall. All materials shall be compatible with chemical service and as indicated in the fitting schedule above. For NSF/ANSI 61 certification, EPDM or Viton GF gaskets shall be supplied.

4. On dual wall tanks greater than 1,000-gallon capacity, bottom fittings must be designed to maintain 110% secondary containment integrity. Bottom containment fitting must include PTFE expansion joint designed to accommodate movement of primary tank in design accordance with ASTM-D 1998 tolerances. All secondary containment fittings and parts shall be resistant to chemical fume corrosion. Fitting shall include the option to connect a secondary containment pipe over primary pipe.

5. All tank fitting attachments on the lower third sidewall of tanks greater than 1,000-gallon capacity shall be equipped with flexible couplers or other movement provisions recommended by the tank manufacturer. The tank will deflect based upon tank loading, chemical temperature and storage time duration. Tank piping flexible couplers shall be designed to allow 4 percent design movement. Movement shall be considered to occur both outward in tank radius and downward in fitting elevation from the neutral tank fitting placement.

Tank Attachments and Accessories

- **Level Sensors**: All tanks shall be equipped by the supplier with ultrasonic level sensors. The level transmitter shall be Siemens Sitrans Probe LU or equal. The sensor mount location shall be per the Plans and supplier shall provide tank mounting system for sensor.

- **Float Indicator**: All tanks shall be equipped by the supplier with a reverse float level indicator. The level indicator shall be assembled to the tank and shall consist of a PVC float, indicator, polypropylene rope, perforated interior pipe, PVC roller guides, clear UV resistant PVC sight tube, and necessary pipe supports. The level indicator shall act inversely to the tank contents and shall not allow entrance of tank contents into the sight tube at any time. Indicator shall be neon orange color for visual ease for onsite operators.

- **Secondary Containment Leak Detection**: All secondary containment tanks shall be equipped with a liquid level switch for leak detection on the exterior tank. Switch shall be equal to Rosemount 2120 vibrating fork liquid level switch.

- **Seismic Restraint System**: All tanks shall be equipped with seismic restraints. The restraint system must meet the requirements of the IBC’s most current edition. The complete system shall be constructed of 316 stainless steel materials. Stamped engineering calculations by a registered structural engineer in the State of Oregon shall be submitted as part of the submittal review process. The Contractor shall install per the manufacturer’s
recommendations. Tank manufacturer must provide finite analysis proving that the tank can withstand the structural loads implied.

- **Ladders:** All tanks greater than 6 feet shall be supplied with a ladder. Ladders shall be constructed of fiberglass with 316 stainless steel or better hardware; all ladders shall be designed to meet the State and Federal Occupational Safety and Health Agency (OSHA) Standards, including OSHA 2206;1910.27. Ladders must be mounted to the tank to allow expansion and contraction due to temperature and loading changes. Mild steel parts are not acceptable.

- **Down Pipes:** Tank(s) shall be provided with a dip tube style overflow connection to prevent the escape of gases and chemical vapors. Tank shall be sealed to prevent the release of chemical vapors and gases. Overflow piping (internal and external) shall be tank supported at 6-ft max intervals using material compatible with the chemical stored in the product tank.

- **Fill Pipes:** Tank(s) shall be provided with a fill line that extends to within 12-inches of the floor to prevent splashing when filling the tank. The fill piping (internal and external) shall be tank supported at 6-ft max intervals using material compatible with the chemical stored in the product tank.

- **Vents:** Each tank must be properly vented for the type of material and flow rates expected. Vents must comply with OSHA 1910.106 (F) (iii) (2) (IV) (9) normal venting for atmospheric tanks or other accepted standard, or shall be as large as the filling or withdrawal connection, whichever is larger but in no case less than 1-inch nominal inside diameter. Tanks shall be vented outdoors and terminated with a screened elbow or tee fitting that will prevent rainwater or insect intrusion.

- **Pipe Supports:** All pipe support materials in contact with the chemical shall be compatible with the chemical being stored.

- **Tank Insulation:** Outdoor tank(s) shall be insulated with a polyurethane foam with a density of 2.5 lb/cubic feet with a minimum “R” value of 6.3/in. The foam shall be applied with a nominal thickness 2-inch layer to the external tank surfaces except the tank bottom. Upon completion of application and curing of the insulation, 2 full coverage coats of latex mastic coating shall be applied to the surface of the insulation in such manner as to seal the insulation from the outside environment.

- **Overflow switch:** An overflow switch shall be installed on the overflow line at the exterior of the tank to provide alarming if the tank level overflows.

**Spare Parts**

Provide one (1) shelf spare ultrasonic level transmitter for each make/model installed. Shelf spare can be used to measure chemical level within temporary chlorination system tote tank.

Provide one (1) spare overflow switch for each make/model installed.
Part 3 - Execution

Installation/Construction

Installation shall be in accordance with the manufacturer’s recommendations.

Field Quality Control

1. Field testing shall be in accordance with the manufacturer’s recommendations.

2. After installation of tank and all fittings, the tank shall be water tested by filling the entire tank with water and monitoring the tank, as well as all fitting connections, for at least 24 hours. Any leaks shall be corrected prior to acceptance. Following successful field tank testing as determined by the engineer, each tank shall be completely emptied, cleaned of all foreign material and dried. The tank shall be filled by the Contractor with the chemical to be stored and allowed to soak for 5 working days. Any leaks, as determined by the engineer or Owner, shall be corrected prior to placing the tank into service.

11.90 OTHER EQUIPMENT

11.95 Heating, Ventilating, and Air-Conditioning

11.95.1 Common Work for HVAC

Part 3 – Execution

Install per HVAC units per strict conformance with manufacturer recommendations. Brackets and support frames if needed shall be provided in order to properly install the HVAC equipment meeting manufacturer requirements.

11.95.34 Fans

11.95.34.1 Wall Ventilators

Part 1 – General

Summary

The Contractor shall provide and install ventilators as shown on the Plans and noted herein. See Ventilator Schedule on the Plans for design and performance requirements.

Related Sections

Division 17.53.2 – Cooling Thermostat

Division 8.90 – Ventilation

Submittals

Submit detailed product information including specifications, sizing information, performance curves, dimensional drawings, accessories, and other information relevant to this project.
Part 2 – Products

Manufacturers
The following manufacturers are considered to be acceptable “or equals” unless otherwise noted on the Plans or herein.

- ACME
- Fantech
- Penn Ventilation

Accessories
Provide all accessories needed for a complete installation including wall and roof thimbles, backguards, and mounting sleeves.

Finishes
In chemical rooms or other corrosive environments, all materials in contact with room air shall be fully resistant to corrosion from atmospheric conditions.

Part 3 – Execution
Install per manufacturer recommendations.
Provide a disconnect switch for each unit.
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Division 13
Special Construction – This Division Not Used
15.00 GENERAL

This division covers the work necessary for furnishing and installing mechanical appurtenances and accessories as described in these Specifications and shown on the Plans. Sections in these specifications titled “Common Work for . . .” shall apply to all following subsections whether directly referenced or not.

15.05 Common Work for Mechanical

Part 1 - General

Summary

Provide the necessary piping, plumbing, fittings, and appurtenances to make all piping systems complete, tested, and ready for operation as specified herein and as shown on the Plans. Some fittings that are necessary for the complete piping system installation and operation may not have been shown. Provide fittings, pipe, and appurtenances necessary, whether shown on the Plans or not, to make all piping systems complete, tested and ready for operation.

Some pipe supports, thrust blocking, and tie rods are not shown on the Plans. Provide pipe supports, thrust blocking, and tie rods for pipes as required by accepted design criteria to support and restrain the loads encountered.

Related Sections

- Division 1.81 Seismic Restraint and Anchorage
- Division 1.82 Pressure Ratings
- Division 10.14.3 Pipe Markers

References

All products in contact with drinking water to be low-lead (less than 0.25 percent) content in compliance with NSF/ANSI 372.

Submittals

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

- Pipe and Fittings
- Valves and Appurtenances
- Other mechanical components listed in this division or required by the Engineer

Part 2 – Products

Existing Products

Materials

All valves, meters, hydrants, specialties, appurtenances, and other such mechanical and plumbing components that are of similar purpose shall be of a single manufacturer and model
line. Do not “mix and match” unless specifically stated otherwise or allowed by the Engineer. The intention of this requirement is to maintain consistency across all components installed on the project for function, maintenance, aesthetics, and details of installation.

15.11 Open Trench Pipe Installation

15.11.05 Common Work for Pipe Installation

Part 3 - Execution

Installation

For push-on joint PVC pipe, joints shall not be pushed home. Stop the assembly when the marked insertion line is at the face of the bell. This is to allow for thermal expansion if the pipe is installed in cold weather. If the pipe has been pushed home, pull back to expose the insertion line.

15.11.50 Trench Patching

Part 1 - General

Scheduling and Sequencing

The Contractor shall be required to patch all trenches installed within the existing pavement with Commercial Hot Mix Asphalt to the depth as shown in the Plans. Trench patches shall be installed no later than the second Friday following excavation for trenches parallel to the road, and no later than two days following excavation for trenches crossing the road and across intersections.

On trenches parallel to the roadway, the Contractor shall provide and maintain crushed surfacing base course to a smooth and level grade with the existing pavement until final patching is complete.

On trenches crossing the roadway or intersections, the Contractor shall provide and maintain asphalt hot or cold mix until final patching is complete.

Maintenance

Crushed surfacing shall be inspected and repaired continuously, including over weekends and other non-working periods. Temporary patching, regardless of material used, shall be incidental to the project cost. No additional payment will be made.

Part 3 - Execution

Field Quality Control

Pavement patching that must be removed and replaced due to any failed testing will not
15.20 PIPE AND FITTINGS

15.21 Common Work for Pipe and Fittings

Part 2 - Products

Components

Under no circumstance shall the fasteners be of lesser strength or higher corrosive potential than the materials being connected. In the event that dissimilar metals are adjacent (for example: stainless steel flange connecting to ductile iron flange) a dielectric insulation kit shall be used.

Fasteners for pipe and fittings: Per AWWA standards unless otherwise specified. All relevant subsections of AWWA C100, C200, and C500. All bolts and studs shall be long enough so that no less than two threads extend beyond the face of the nut. Non-submerged flange bolts to be ASTM A307 Grade A, zinc plated.

For submerged conditions, connection bolts shall be Nitronic 60 steel. Nuts and washers shall be Stainless Steel, minimum grade 304 in raw domestic or treated domestic water and minimum grade 316 in treatment processes and sewage applications. Minimum grade 317 for acidic transport. Bolts and nuts shall meet ASTM F593 and F594. Stainless steel shall not be used where in contact with chlorine or chlorine solutions. Stainless steel bolts may be used in lieu of Nitronic but must be assembled using appropriate lubricant or tape. For installations in domestic water, lubricant, or tape must be approved for domestic water service. Cobas Stainless Steel Thread Sealing Tape or approved equal.

Finishes

For conditions other than submerged, all nuts and bolts shall be zinc plated, and suitable for above and below grade locations as required. Where above grade/exposed piping is specially coated, the connecting nuts and bolts shall be coated using the same system.

Part 3 - Execution

Construction

All piping and related equipment to be joined together shall be connected as shown on the Plans, specifications, as recommended by the manufacturer or as required by standard industry practices if not otherwise specified.

15.22 Metal Pipe and Fittings

15.22.05 Galvanized Steel Pipe

Part 1 - General

Design Requirements

Galvanized steel pipe shall conform to ASTM A53/A53M. Hot dip galvanizing shall be completed in conformance with ASTM A123/A123M. Piping shall be sized as shown on the Plans and capable of the hydrostatic working and testing pressures as indicated in the pressure section above.
Part 2 - Products

Components
Wrap pipe if buried below grade. Provide dielectric couplings and bonding as shown on the Plans or as required by the Owner’s standard details.

15.22.06 Copper Pipe and Fittings

Part 2 - Products

Materials
Copper piping and tubing shall be drawn and meet the requirements of ASTM B-88. Use Type L hard temper for exposed areas and through concrete. Use Type K hard temper for buried services. Use Type L soft under concrete floor.

Fittings for exposed pipe shall be flared or soldered meeting the requirements of ANSI B16.22. Lead content of solder shall be no more than 0.2 percent. Compression type fittings (Swagelok, Gyrolok, Parker CPL, or equal) are also acceptable when thrust restraint is not needed.

Fittings for buried, concealed, and encased pipe shall be soldered.

Part 3 - Execution

Installation
For exposed pipe, straighten any curved, or bent pipe. Runs shall be parallel and perpendicular with floors and walls unless positive drainage is required.

15.22.08 Brass/Bronze Pipe and Fittings

Part 1 - General

References
Brass to be low-lead content in compliance with NSF/ANSI 372 to have no more than 0.25 percent lead content.

Brass nipples: ASTM B687
Brass fittings: ANSI/ASME B16.15 (threaded) Class 125 lb. (up to 200 psi water), 250 lb. (up to 400 psi water); B16.18 (soldered).

Part 2 - Products

Materials
Brass pipe, nipples, and fittings to have threaded ends.
15.23 Non-Metal Pipe and Fittings

15.23.04 ABS Plastic Pipe and Fittings

Part 2 - Products

Materials

Acrylonitrile-butadiene-styrene (ABS) plastic pipe and fittings shall be used for drain, waste and vent piping. ABS plastic pipe and fitting material and installation procedures shall meet the requirements set forth in ASTM F-628 (cellular core wall pipe and fittings).

The use of cellular core ABS (ASTM F628) must be pre-approved by the Engineer. Submit the locations and purpose of the proposed pipe to the Engineer no less than two weeks prior to installation.

15.23.05 CPVC Pipe and Fittings – Solvent Weld

Part 2 - Products

Materials

Chlorinated polyvinyl chloride (CPVC) material for pipe fittings and couplings shall conform to ASTM D-1784, Type I, Grade 1, with 2,000 psi design stress. Pipe shall be Schedule 40 or 80 in accordance with ASTM D-1785, as shown on the Plans.

All pipe shall be white unless shown otherwise on the Plans.

Part 3 - Execution

Installation

For exposed locations that will not be painted, primer and glue must be applied carefully and not allowed to run. Areas where primer/glue has run more than ¼-inch past the joint will be cleaned, painted, or replaced by the Contractor at the discretion of the Owner.

15.23.06 Polyvinyl Chloride (PVC) Pipe and Fittings for Sewer – Push on Joint

Part 1 - General

Design Requirements

Pipe and fittings shall meet the requirements of ASTM Specification D3034 for 4-inch to 15-inch Standard Dimension Ratio (SDR) 35. Pipe shall be suitable for use as a gravity sewer conduit.

Part 2 - Products

Materials

Provisions must be made for contraction and expansion at each joint with a rubber ring. The bell shall consist of an integral wall section with a solid cross-section rubber ring, factory assembled, securely locked in place to prevent displacement during assembly. Standard laying lengths shall be 20 feet and 12.5 feet plus or minus 1-inch. At manufacturer’s option, random
lengths of not more than 15 percent of total footage of each size may be shipped in lieu of standard lengths.

All fittings and accessories shall be as manufactured by the pipe supplier or approved equal and have bell and/or spigot configurations compatible with that of the pipe.

15.23.12 PVC Pipe for Drain, Waste, and Vent (DWV)

Part 2 – Products

Design Requirements

Polyvinyl chloride for drain waste and vent (PVC-DWV) material for pipe fittings and couplings shall conform to ASTM D-1784, Type 1, Grade 1, with 2,000 psi design stress. Pipe shall be Schedule 40 or 80 in accordance with ASTM D-1785 and D2665 as shown on the Plans. Pipe shall be dual labeled.

Cellular core PVC shall conform to ASTM F891. Fittings and installation for cellular core PVC shall be per ASTM D2665.

Part 3 - Execution

Installation

Pipe bedding shall be clean granular material with no organics and no rocks larger than ½-inch for angular rock or ¾-inch for round-rock. Any cellular core pipe that is damaged in any way shall be removed and replaced with sound pipe.

15.30 VALVES

15.31 Common Work for Valves

Part 1 – General

Design and Performance Requirements

Valves noted on the Plans or in other parts of the Specifications shall meet the requirements herein. Valves shall be designed for the intended service.

Valve suppliers shall review the design and certify that the valve provided in the submittal is appropriate for the application and will operate as shown and described. Any discrepancies from the design and the valves shall be brought to the Engineer’s attention during the bidding process. Valves that do not operate as specified and per normal industry standards shall be replaced or modified so that they operate within the design parameters at the Contractor’s expense.

Pressure rating shall be per Division 1.82 and Division 15.06 unless shown otherwise.

Part 2 – Products

Components

All valves shall be provided with manual operators unless otherwise noted. Unless otherwise indicated, the direction of rotation of the wheel, wrench nut, or lever to open the valve shall be counter-clockwise. Each valve body or operator shall have cast thereon the word OPEN.
and an arrow indicating the direction to open. Remote controlled valves and hand operated valves requiring remote position indicators shall have built-in limit switches.

Gearboxes that are buried and which may be exposed to groundwater or located below the water surface shall be designed for submerged service and have a watertight gasket and be greased filled. All nut extensions and extension guides for submerged valves shall be stainless steel.

**Manual Operators**

All manual operators shall, unless otherwise specified, be equipped with a geared operating wheel. Valves less than 4 inches may use lever operators.

Wrench nuts shall be provided on all buried and submerged valves; on all valves which are to be operated through floor boxes; and where shown, unless noted otherwise. All wrench nuts shall comply with Section 20 of AWWA C 500. Valve operators shall be designed to require a minimum of 12 turns to close the valve, unless otherwise noted on the Plans. A minimum of four (4) operating keys per size shall be provided for operation of the wrench nut operated valves. Extend shafts to within 6 inches from grade, and support every 5 feet with the last support just below the operating nut.

Exposed valves shall be equipped with lever actuator for valves 4 inches and smaller, or geared operating handwheel actuator for valves 6 inches and larger, unless otherwise noted on Plans.

If shear pins are installed with any valve, the manufacturer shall certify the shear pin(s) to fail between 95 percent to 99 percent of the operator shaft failure torque.

**Valve and Floor Boxes**

Cast-iron valve boxes extending to the finished or established ground or paved surfaces shall be provided for all buried and encased valves. They shall have suitable base castings to fit properly over the bonnets of their respective valves and heavy top sections with stay-put covers. Boxes shall be of the screw or sliding type having 5¼-inch shaft diameter or greater. All parts of the valve boxes, bases and covers shall be coated by dipping in a hot bituminous varnish, except that those set in concrete shall be galvanized.

A floor box shall be provided for key operating valves located below a concrete slab. Each floor box shall be of the depth required for installation in the slab. Where the operating nut is below the slab, the opening in the bottom of the box shall be sufficient for passage of the operating key. Each floor box and cover shall be coated by dipping in hot asphaltic varnish, except that those set in concrete shall be galvanized, or as noted on Plans.

Covers for all boxes shall have cast thereon an appropriate name designating the service for which the valve is used.

**Part 3 - Execution**

**Installation**

Install valves in strict accordance with the manufacturer’s instructions and as shown on the Plans. Provide buried valves will all operators or valves boxes installed so that wrenches or operators perform freely and without binding or other interference. Bed and backfill buried
valves according to the requirements of the pipe to which they are attached. Provide concrete supports for operators where required and as shown on the Plans.

Install valves and fittings in accordance with manufacturer's recommendation and the Plans. Verify alignment and adjustments after installation.

15.32 Isolation Valves

15.32.02 Resilient Wedge (Seat) Gate Valves

Part 1 – General

Design Requirements

All gate valves for water lines 2 inches and larger shall be of the resilient, wedge-type, non-rising stem and shall meet or exceed the performance requirements of AWWA C509, Resilient-Seated Gate Valves for Water Supply Service. All cast ferrous components shall be ductile iron. Reduced wall thickness, per AWWA C515 are not acceptable. All gates valves shall be capable of a minimum working pressure of 200 psig. Higher pressure applications as noted on the plans shall have a rated working pressure of 250 psig. Valves shall be suitable for installation with the type and class of pipe and flange being installed. The wedge shall be fully encapsulated with vulcanized SBR rubber. Flanges shall conform to ANSI/AWWA C110/A21.10 and have facing and drilling patterns to match AWWA C110 fitting flanges, AWWA C115 threaded-on flanges and ANSI B16.1 Class 125 flanges, ANSI B16.1 Class 250 or as specified in the Plans.

Part 3 - Execution

Installation

Install valves in strict accordance with manufacturer's instructions and as shown on the Plans. Verify alignment and adjustments after installation. Provide buried valves with all operators or valve boxes installed so that wrenches and operators perform freely and without binding or other interference. Bed and backfill buried valves according to requirements of the pipe to which they are attached.

15.60 PRESSURE AND LEVEL MEASUREMENT

15.60.01 Common Work for Pressure and Level Measurement

Part 1 – General

Related Sections

• Division 17 - Electronic Pressure and Level Devices

Design Requirements

Pressure and level measurement devices shall be scaled and rated for the application.
Part 3 – Execution

Installation

All devices shall be installed to be field serviceable without taking the facility out of service. Readouts shall be positioned to be easily read from a standing position and central to the room, unless otherwise allowed by the Engineer.

15.61 Pressure Gauges

Part 1 – General

References

• ASTM B40.1 Grade 2A

Performance Requirements

Gauge accuracy shall be ± 0.5 percent of full scale.

Submittals

Provide catalog sheets showing dimensions, pressure range, accuracy and optional accessories.

Part 2 – Products

Manufacturers

Wika, Marsh, 3D Instruments or approved equal.

Materials

Gages shall be analog, stem mount type with 4½ scale face, glycerin filled and completely suitable for measuring potable water. Connection shall be ¼-inch threaded, unless otherwise noted. Wetted parts shall be brass, bronze or stainless steel. The full scale pressure range for each gauge location shall be as specified on the Plans.

Part 3 - Execution

Installation

Install gauges as shown on the Plans. Support gauges adequately.

Field Quality Control

Provide calibrated test gauges for each scaled range. Build a temporary, common testing manifold that can hold all similarly scaled gauges plus the test gauge at one time. Pressurize the manifold to the pressure specified by the Engineer. Gauges that do not meet the accuracy requirements shown under the Performance Requirements shall be replaced at the Contractor's expense.
15.75.13 Electronic Solenoid Valves

Part 2 – Products

Manufacturers

Electronic solenoid valves shall be equal to ASCO, Red-Hat, Model 8210 general service, 2-way solenoid valves.

Manufactured Unit

Provide electronic solenoid valves fabricated from forged brass body with buna-n seals and discs. Provide shading coil fabricated from copper. Valves shall have normally closed type operation and shall open when solenoid is energized. Solenoid valve shall be pressure rated for 100 psi at 180° F and UL listed for a safety shutoff valve. Solenoid valve shall operate from a 120 VAC power source.

15.80 WATER TREATMENT PROCESS PIPING

Part 1 – General

The work and materials described in this section include pipe, valves, and fittings installation for conveying:

• 12.5 percent Sodium Hypochlorite (NaOCl) solution in high-pressure injection lines; and, in the other chemical solution generation and storage system lines.

It is required that the proper materials be used, and that skilled and experienced pipe fitters construct the chemical transmission and injection piping. Pipe, fittings, primers, and cements used shall be suitable for carrying the listed chemicals. All final joints on the piping system must be strong, watertight, free from stresses, and ready for a 20-year life of daily use.

As part of the submittals, the Contractor shall list the names of the pipe fitters that will perform the installation, and the names of chemical treatment project, including chemical names, on which they have installed piping. Installers shall be experts at the installation of chemical process pipe, and shall have performed at least ten chemical treatments projects using the materials specified herein. Submittals shall also indicate the compatibilities of the wetted materials with the chemicals used and the applicable pressure ratings.

Related Sections

• Division 1.82 Pressure Ratings
• Division 11.64.13 Chemical Feed Equipment
• Division 15.40.3 Pipe, Valve, and Conduit Supports
• Division 15.60 Pressure and Level Measurement

Submittals and Design

1. Provide annotated product information on all pipe, fittings, valves, and accessories to be used. All pipe, fittings, valves, and accessories shall be rated for the applicable working and testing pressures as indicated herein. All wetted materials provided, including gaskets, seals, diaphragms, etc. shall be compatible with the chemicals used in the application. All wetted materials used shall include a chemical compatibility chart to be submitted for
approval. Provide submittal information on primer and solvent cement showing compatibility with specified chemicals and pressures.

2. The Contractor shall submit the manufacturer's written installation methods to the Engineer for approval prior to installing PVC pipe. The installation instructions shall include application methods and equipment; primer contact times, and application quantities; cement curing time, and application quantities; and all other special construction requirements.

Spare Parts

Supply two of each of the following for each diameter and material supplied unless otherwise noted:

- True Union Ball Valve(s)
- Diaphragm Valve(s)
- True Union Ball Check Valve(s)
- Air Release Valve
- Pressure Relief Valve
- (Combination) Back Pressure Sustaining and Anti-Siphon Valve
- Y-strainer
- Gaskets
- Pulsation Dampener Bladder
- Flow Switch

Part 2 – Products

General

All pipe, fittings, valves, and accessories shall be rated for the applicable working and testing pressures as specified herein. Unless otherwise noted on the Plans or specified herein, all valves, fittings, and pipe conveying the chemical(s) shall be as follows:

<table>
<thead>
<tr>
<th>Chemical</th>
<th>Plastics</th>
<th>Metals*</th>
<th>Elastomers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sodium Hypochlorite</td>
<td>CPVC</td>
<td>Titanium (where available)</td>
<td>Viton</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hastelloy C (elsewhere)</td>
<td></td>
</tr>
</tbody>
</table>

*Due to incompatibility, no stainless steel parts shall be in contact with sodium hypochlorite.

The Contractor shall verify the suitability of the specified materials prior to bidding and submittals. Any discrepancies shall immediately be brought to the attention of the Engineer. Where discrepancies are noted, the Contractor shall assume that the more corrosion-resistant material shall be used.
Pipes and Fittings

Polyvinyl Chloride (PVC) and Chlorinated Polyvinyl Chloride (CPVC) Pipe and Fittings

Chlorinated polyvinyl chloride (CPVC) and polyvinyl chloride (PVC) pipe for pipe fittings and couplings shall conform to ASTM F-441, F-437, and F-439. Pipe for chemicals shall be schedule 80.

The objective of the primer and cement shall be to form a fused CPVC or PVC weld between the CPVC or PVC pipe and fittings. The Contractor shall submit, for the Engineer's approval, the names of the proposed primer and cement, and the CPVC or PVC pipe manufacturer's written recommendations stating the selected primer’s and cement’s suitability for use with the listed chemicals. All primer and cement shall be new.

Polyethylene (PE) Tubing and Fittings

Provide flexible polyethylene thermoplastic tubing fabricated from high molecular weight resins. Resistance to environmental stress cracking: meet or exceed requirement set forth in ASTM D 1693. Polyethylene tubing shall conform to standard set forth in ASTM D124878 for Type 1, Class A, Category 4, Grade E5 polyethylene tubing and shall be equal to Harrington polyethylene flexible, clear, or translucent tubing.

Valves

True Union Ball Valves

Provide true union ball valves fabricated from materials suitable for the intended chemical application and as specified above. All ball valves must be of the True Union type and for Bleach service (compatible with 12.5% off gassing) with an energized seat that will concurrently provide automatic adjustment for wear and leak-free service at the lower pressure port, and with a ball containing an adequate vent to the higher pressure port. The manufacturer of all PVC bleach ball valves must complete all components prior to the factory assembly, test and packaging of those valves. Modification of assembled valves by any manufacturer or vendor is unacceptable. The ball valve bodies must be permanently marked externally with NSF (symbol of NSF International), indicating approval for use with potable water, “bleach” and two opposing directional arrows, one inscribed with “flow”, and the other with “vent.” Valves designed for panel mounting shall have handle extension designed for panel mounting. Valves shall be equal to Hayward, Chemtrol, George Fischer (+GF+), ASAHI/America, or Engineer approved equal.

True Union Ball Check Valves

Provide true union ball check valves fabricated from materials suitable for the intended chemical application and as specified above. Ball check valves shall be listed by NSF for use in potable water systems. Valves shall be equal to Hayward, Chemtrol, George Fischer (+GF+), ASAHI/America, or Engineer approved equal.

Butterfly Valve

All valve materials used shall be recommended by the manufacturer for the intended process and/or chemical service application. Valves shall be lug style with ANSI standard bolt pattern.
Valves shall be equal to Hayward, Chemtrol, George Fischer (+GF+), ASAHI/America, or Engineer approved equal.

**Air Release Valves**

Provide air release valves at chemical system high points. Unless otherwise shown on the Plans, air release valves should be routed to the building exterior and shall not be combined with any other chemical system or DWV vent line. The air release valve shall be a Plastomatic or approved equal. Valves shall be fabricated from materials suitable for the intended chemical application and as specified above.

**Pressure Relief Valves**

Relief valves shall prevent over-pressurization of the lines to which they are attached. Valves shall be fabricated from materials suitable for the intended chemical application and as specified above. The valve shall be Griffco, in the size shown on the Plans, or approved equal, and designed for in-line operation, unless otherwise shown on the Plans.

**(Combination) Back-Pressure Sustaining and Anti-Siphon Valve**

Provide combination backpressure sustaining and anti-siphon valves as shown on the Plans. The valve shall also function as a backpressure sustaining valve to maintain a constant backpressure on the metering pumps. Valves shall be fabricated from materials suitable for the intended chemical application and as specified above. The valve shall be a Griffco, in the size shown on the Plans, or approved equal, and designed for in-line operation, unless otherwise shown on the Plans.

**Appurtenances**

**Y-Strainers**

Provide clear Y-strainers fabricated from clear material suitable for the intended chemical application and as specified above. Provide filter screen fabricated from corrosion-resistant materials and with an open area equivalent to twice the nominal pipe size. Y-strainers shall be rated for pressures as specified in the Pressure Rating section of this Division.

**Calibration Column**

Furnish and install calibration columns as shown on the Plans. Column shall be constructed of clear material suitable for the intended chemical application and as specified above with easy to read graduation in gph. Column shall be sized for the chemical pumping rates. Column shall be supplied by Griffco Valve, Inc., or equal, and shall have a vented cap.

**Expansion Joint**

Where identified on Plans, provide PTFE expansion joint with three or more convolutions and external stainless steel reinforcing rings, limit rods with elastics pop nuts, and 150# ANSI standard drill flanges. All wetted surfaces to be PTFE shall be suitable for a maximum operating pressure, temperature, and movements noted, and shall be designed to the Fluid Sealing Association (FSA) design standard. Expansion joint shall be by Flexicraft Industries,
Ethylene Flexijoint or approved equal. All materials shall be recommended by the manufacturer for the intended process and/or chemical service application.

**Pulsation Dampener**

Pulsation dampeners shall be provided in quantity and location as shown on the Plans. Pulsation dampeners shall be constructed of materials suitable for the specified chemicals and pressures. Bladder material shall be compatible with the chemicals used, and shall be chargeable, not requiring continuous air supply. Pulsation dampeners shall be sized for the installed application. The manufacturer’s representative shall set pulsation dampeners based on normal operating pressure. Pressure gauges shall be equipped on all units. Pulsation dampeners shall be as manufactured by Blacoh Fluid Control.

**Pressure Gauge**

Provide pressure gauge with diagram (chemical) seal per Section 15.60.

**Part 3 – Execution**

All piping shall be cut square, deburred, and cleaned of all dirt, grease, and oils before joining. Once installed, all piping shall be flushed to clear the lines of debris. Pressure test to the system using water. Upon passing water pressure test, fill all pipes with chemical solution to be used during normal operations. Pressurize all piping to normal operating pressure for a period of five days. Correct all leaks and drips at the conclusion of this testing. At the determination of the Engineer, pressure test may have to be repeated if a large number of leaks or drips are repaired. All valves and appurtenances shall be set based on manufacturer’s recommendation and the operation pressures identified.
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 Section 1.33.2 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.

Permits and Fees

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.

- Division 8.90 Motorized louvers/dampers
- Division 10.14.8 Signs for electrical equipment
- Division 11.20 Pump motors
- Division 11.95.34 Fans
- Division 15.12 Valves with position indication and controls
- Division 15.15.1 Flow meter transmitters
- Division 17 Automatic Control
- Division 17.50 Sensors and controls

Codes and Standards

Provide all electrical work in accordance with latest edition of National Electrical Code, National Electrical Safety Code, Oregon Electrical Specialty 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 Oregon. Recognized labels in the State of Oregon are UL, ETL, and CSA-US.

Definitions

Dry Locations: All those indoor areas which do not fall within the definitions below for wet, damp, or corrosive locations and which are not otherwise designated on the Plans.

Wet Locations: All locations exposed to the weather, whether under a roof or not, unless otherwise designated on the Plans.

Damp Locations: 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.

Corrosive Locations: Areas where chlorine gas under pressure, sulfuric acid, or liquid polymer are stored or processed. These areas are identified on the Plans.

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.

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. Combination Motor Starter Disconnect
2. Circuit Breakers
3. Conduit and Fittings
4. Outlet and Junction Boxes
5. Wire and Cables
6. Switches and Receptacles
7. 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.

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 to walls, floors, and the like shall meet the requirements of Division 05.05.23.

NEMA Rating

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

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

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.

16.15 Electrical Grounding

16.15.1 Common Work for Electrical Grounding

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.

Part 2 - Products

Components

The grounding systems shall consist of the ground rods, grounding conductors, ground bus, ground fittings and clamps, and bonding conductors to water piping and structural steel as shown on the Plans.

System components shall be as allowed in the NEC unless specified otherwise below:

1. Ground Conductors: Buried conductors shall be medium-hard drawn bare copper; other conductors shall be soft drawn copper. Sizes over No. 6 AWG shall be stranded. Coat all ground connections except the exothermic welds with electrical joint compound, non-petroleum type, UL listed for copper and aluminum applications.

Part 3 - Execution

General Grounding Installation

When available a UFER ground per latest edition of NEC shall be provided as the primary means to ground the electrical system.

Ground electrical service neutral at service entrance equipment to supplementary grounding electrodes.

Ground each separately derived system neutral to nearest effectively grounded building structural steel member or separate grounding electrode.

Provide a ground rod box for each ground rod to permit ready access to facilitate testing.

Provide a ground wire in every conduit carrying a circuit of over 110 volts to ground.

Make embedded or buried ground connections, taps and splices with exothermic welds. Coat ground connections.

Bond metallic water piping at its entrance into each building.
Motor Grounding Installation
Extend equipment ground bus via grounding conductor installed in motor feeder raceway. Connect to motor frame.
When using nonmetallic flexible tubing install an equipment grounding conductor connected at both ends to noncurrent-carrying grounding bus.

Ground Connections
Above grade ground connections shall be exothermic weld, mechanical, or compression-type connectors; or brazing.
Below grade ground connections shall be exothermic weld.
Install all ground connections is strict accordance with connector manufacturer’s recommendations and methods.

16.30 BASIC PANEL EQUIPMENT AND DEVICES

16.31 Operating and Indicating Devices
Part 1 - General
Operating and indicating devices minimum rating shall be NEMA 13. Operator devices mounted in outdoor panels, corrosive areas or where exposed to moisture shall be NEMA 4X.

16.31.4 Indicating Lights
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.

16.31.5 Selector Switch
Manufacturers
Heavy-Duty, Watertight, and Corrosion-Resistant Type:
- Eaton/Cutler-Hammer, Type E34
- Square D Co., Type SK
City of Roseburg  
Chlorination System Improvements  
Division 16  
Fall 2019

- 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 \( \frac{1}{16} \)-inch minimums to \( \frac{1}{4} \)-inch maximum.

### 16.31.6 Pushbuttons

**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 stop” applications shall have maintained contacts and red mushroom head operators.

### 16.32 Panel Relays

**Part 1 – General**

**General**

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 amp; (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

16.32.1 Control Relays

Manufacturers

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

Manufactured Units

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.

16.35 Control Panel Accessories

16.35.1 Terminal Blocks

Part 2 – Products

Manufactured Units

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, clearly visible with the protection cover removed.

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. All wires shall be labeled with the circuit number and common function.

16.35.2 Nameplates

Part 2 – Products

Manufactured Units

Standard nameplates shall be made of 1/16-inch thick machine engraved laminated phenolic having black letters not less than 1/16-inch high on white background. One-inch high lettering
shall be used for the large nameplates required for the control panels and motor control centers.

**Part 3 – Execution**

**Installation**

Nameplates shall be provided on all electrical devices including but not limited to motor control equipment, MCC cubicles, control stations, junction boxes, panels, motors, instruments, switches, indicating lights, meters, and all electrical equipment enclosures. Each motor control center compartment and control panel shall have a nameplate designating the equipment and its identifying number and size or rating. Data shall be as shown on the Plans and reviewed via the submittal process. Nameplates shall have name, number and/or function as is applicable for clear identification.

Provide one large nameplate for each motor control center and/or control panel identifying the equipment as indicated on the Plans.

Nameplates on steel panels shall be secured with stainless steel drive screws. Where it is proposed that nameplates will be secured with pressure sensitive tape or bonding cement, the process and samples shall be submitted to the Engineer for acceptance.

Nameplates shall be provided for identifying all operator interface (lights, switches, etc.) and other devices that are located outside or inside the panels.

Nameplates shall be provided for identifying all relays and devices that are located inside the panels.

**Special Functions**

Provide warning nameplates on all panels and equipment, which contain multiple power sources. Lettering shall be white on red background.

**16.40 LOW VOLTAGE MOTOR CONTROL EQUIPMENT**

**16.41.2 Combination Motor Starter Disconnect**

**Part 1 - General**

**Design Requirements**

Each unit shall consist of a circuit breaker disconnect switch and a magnetic starter.

The combination shall have an interrupting rating of not less than 42,000 amperes symmetrical at 480 volts. Each unit shall have a control terminal board and other components as shown on Plans.

Starters shall be of NEMA, not IEC design. That is, starters shall have molded coils, replaceable contacts, and metal mounting plate. Starters shall have provisions for accepting up to seven (7) auxiliary contacts and one (1) overload alarm contact.

All starters shall be size 1 or larger and no intermediate sizes (such as 1½) will be acceptable.

Pilot devices shall be per Division 16.30 Basic Panel Device and Equipment.
Part 2 – Products

Manufactured Units

Overload protection is to be provided by a solid-state overload relay that shall be self-powered. Each overload shall be adjustable over a full 2:1 FLA adjustment range. A tamper proof cover shall be provided. The standard overload shall provide Class 20. The overload relay must provide phase loss protection. The overload must be ambient insensitive. The overload relay must have a trip-free, normally-closed contact with a visible trip indication and N.O. isolated alarm contact. The overload shall have a method of being manually tripped for test purposes. Size the overload heaters to protect the motor actually installed with allowance for power factor correction, if applicable.

Terminal blocks shall be mounted within the unit and located near the front for accessibility. They shall not be located at the rear of the vertical wireway. Power terminal blocks shall be provided. On non-plug-in (frame mounted) units, terminal blocks need not be pull-apart style. On plug-in units, control terminal blocks shall be pull-apart style.

Starter units shall contain the number of auxiliary contacts, unit-mounted devices, indicating lights, control relays, and other devices as shown on the Plans.

16.55 Switches and Protective Devices

16.55.1 Common Work for Switches and Protective Devices

Part 1 - General

Design Requirements

Overcurrent devices shall be NEMA rated.

Extra Materials

Provide one fuse for each ungrounded conductor and a minimum of one spare fuse per phase of each ampacity and voltage used on the project. Deliver fuses to Owner at the completion of the project.

Part 3 – Execution

Installation

Overcurrent protection devices and safety switches shall be centered 60 inches above the finished floor unless noted otherwise on the Plans.

16.55.13 Fuses

Part 1 - General

Design Requirements

Fuses shall be of the type and amperage indicated on the Plans. The voltage rating shall be appropriate for the application indicated. The fuse types indicated on the Plans imply a certain set of fuse characteristics. No substitutions of fuse types will be allowed without Engineer approval.
Part 2 - Products

Manufacturers

Fuses shall be:

- Bussman,
- Gould Shawmut
- Littlefuse
- Reliance
- Or Equal

Materials

Fuses in motor circuits which are indicated but not sized, shall be provided with Manufacturer’s recommended size based on the actual motor installed. In-line or integrally-mounted fuse clips shall be provided on all control power or low-voltage transformers.

16.55.16 Molded Case Circuit Breakers

Part 1 - General

Design Requirements

Breakers shall have the interrupting rating and trip rating indicated on the Plans. All breakers shall be calibrated for operation in an ambient temperature of 40 degrees Celsius.

Part 2 - Products

Manufactured Units

Molded case circuit breakers shall be quick-make and quick-break type with wiping type contacts. Each breaker shall be provided with arc chutes and individual trip mechanisms on each pole consisting of both thermal and magnetic trip elements. Two and three pole breakers shall be common trip. Molded case circuit breakers shall be trip-free. Each breaker shall have trip indication independent of the “ON” or “OFF” positions.

16.55.17 Instantaneous Magnetic Trip Breakers

Part 1 - General

Design Requirements

The magnetic trips shall be adjustable and accessible from the front of all these breakers.

Part 2 - Products

Manufactured Units

Breakers in motor circuits which are indicated but not sized, shall be provided with Manufacturer’s recommended size based on the actual motor installed. Where indicated on the Plans and in the combination motor starter/motor control center schedule, furnish instantaneous magnetic trip only circuit breakers for motor short circuit protection.
16.55.18 Disconnect Switches

Part 1 - General

Design Requirements

Furnish and install disconnect switches conforming to NEMA KS 1, type HD, sized for the ampere and voltage as shown on the Plans and as required by the NEC and nameplate requirements of the equipment served.

Part 2 - Products

Manufactured Units

The switches shall be 600-volt type and horsepower rated. Auxiliary contacts shall be provided as indicated on the Plans.

Part 3 – Execution

Installation

Provide additional disconnects if required by Code.

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 (Installment) 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. Conductor Identification

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.

5. **Electrical Metallic Tubing (EMT):** EMT shall be UL 797 and ANSI C80.3; steel tubing, hot dipped galvanized. EMT fittings shall be ANSI/NEMA FB 1; steel, rain tight, insulated throat, compression type.

**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 ½-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.

**Wireways**

1. **General:** Wireways shall consist of prefabricated channel-shaped, lay-in trough with hinged covers, associated fittings and supports. Straight section shall not be longer than 5 feet. Use 45-degree elbow and tees at all transition points. Cross-sectional dimensions shall be as indicated on the Plans. Fittings shall consist of elbows, tees, crosses and closing plates as required. Wireways shall be designed for continuous grounding.

2. **Finish:** Rust inhibiting primer and manufacturers standard paint inside and out except of stainless-steel type.

3. **Standards:** UL 870, NEMA 520

4. **Watertight (NEMA 4X rated) Wireway**
   a) 14-gauge Type 304 or 316 stainless steel bodies and covers without knockouts and 10-gauge stainless steel flanges.
   b) **Cover:** Fully gasketed and held in place with captive clamp type latches.
   c) **Flanges:** Fully gasketed and bolted.

5. **Dust-tight (NEMA 12 rated) Wireway**
   a) 14-gauge steel bodies and covers without knockouts and 10-gauge steel flanges.
   b) **Cover:** Fully gasketed and held in place with captive clamp type latches.
   c) **Flanges:** Fully gasketed and bolted.
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.
4. EMT for above-grade lighting circuits.

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

All conduits shall be concealed in the floor, walls, ceiling slab, or beneath the floor slab. Surface mounted conduit will not be accepted unless noted otherwise on the construction Plans.

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: ¾-inch
   b) Wireway: 4-inch by 4-inch

All raceways shall contain a separate grounding conductor.

Spare conduits shall contain one 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.

Wireway Installation

1. Straight sections and fittings shall be solidly bolted together to be mechanically rigid and electrically continuous. Dead ends shall be closed. Unused conduit openings shall be plugged.

2. Wireways shall be supported every 5 feet minimum.

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 ⅛-inch at every point, and not less than ¼-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 ⅛-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.
16.75 Wiring Devices

16.75.1 Common Work for Wiring Devices

Part 3 - Execution

Installation

Wiring Devices

1. Position of Outlets: All outlets shall be centered with regard to building lines, furring and trim, symmetrically arranged in the room or outside the structure. Device outlets shall be set plumb and shall extend flush to the finished surface of the wall, ceiling or floor without projecting beyond the same.

2. Unless otherwise noted, wall mounted outlet devices shall generally be 24-inches above the floor, 18 inches in architecturally treated areas, above process piping near process valve boards. Switches shall be 48 inches above the finished floor unless otherwise noted.

Installation of Wall Plates

1. Interior Dry Locations: Install plates so that all four edges are in continuous contact with the finished wall surfaces. Plaster filled will not be permitted. Do not use oversize plates or sectional plates.

2. Exterior and/or Wet Locations: Install plates with gaskets on wiring devices in such a manner as to provide a rain tight weatherproof installation. For receptacle devices, these plates shall maintain the weatherproof rating with an attachment plug inserted and be rated extra-duty. Cover type shall match box type.

Testing

After installation of receptacles, circuits shall be energized, and each receptacle tested for proper ground continuity, reversed polarity, and/or open neutral condition.

GFI receptacles shall be tested with the circuits energized. Devices shall be tested with a portable GFI receptacle tester capable of circulating 7.5 milliamperes of current, when plugged in, between the “hot” line and “ground” to produce tripping of the receptacle. Resetting and tripping shall be checked at least twice at each GFI receptacle.

Submit results of all field testing to the Engineer for review.

16.75.2 Receptacles

Part 1 – General

Design Requirements

Receptacles shall be heavy duty, high abuse, grounding type conforming to NEMA configurations, NEMA WD1 and UL 514 Standards.
Part 2 – Products

Materials

Single and Duplex Receptacles

1. Indoor Clean Areas: Receptacles shall be duplex, 20 amp, NEMA 5-20R, and shall accept NEMA 5-15P and 5-15P plug caps. Receptacles shall be Hubbel 5362, General Electric 4108-2, or equal. Color shall be brown in industrial areas and ivory or white in office and laboratory areas.

2. Outdoor, Process, or Corrosive Areas: Receptacles shall be duplex, 20 amp, NEMA 5-20R, and shall accept NEMA 5-15P and 5-20P plug caps. Receptacle and plug caps shall be corrosion resistant, marine duty with yellow polycarbonate weatherproof lift covers. Receptacles shall be Hubbell 53CM62/53CM21 or equal.

GFI Receptacles

1. Device shall be rated 20 amp, 2-pole, 3-wire, 120-volt, conforming to NEMA WD1.10 configuration. Device shall have a test and reset push buttons. GFI device shall be Hubbell 5362 or equal.

Surface Multiple Outlet Assemblies

1. Units shall have outlets on center-to-center spacing as shown on the Plans. Assembly shall conform to Article 353 of the NEC.

16.75.5 Plates

Part 1 – General

Design Requirements

Plates shall be of the style and color to match the wiring devices, and of the required number of gangs. Plates shall conform to NEMA WD1, UL 514, and ANSI C73. In noncorrosive indoor areas, device plates shall be made of sheet steel, zinc electroplated with chrome finish.

Device plates in corrosive or outdoor areas shall be corrosion-resistant/marine-duty type with weather protective double doors. Device plates for explosion-proof equipment shall be factory provided with the equipment.

Part 2 – Products

Manufacturers

As manufactured by

- Crouse-Hinds
- Appleton
- Or Equal
Components
Device plates shall be provided with engraved laminated phenolic nameplates with \( \frac{1}{8} \)-inch white characters on black background. Nameplates for switches shall identify panel and circuit number and area served. Nameplates for receptacles shall identify circuit and voltage if other than 120 volts, single-phase.

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.
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. Existing Programmable logic controller (PLC) shall provide local, automatic control of on-site pumps and control valves. Computer-based telemetry system will provide remote control, alarm presentation, and data logging activities at the Water Treatment Plant.

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 control panels, 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:

- Chemical Filling Station High Level Alarm Panel
- Ventilation Control Panel
• 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 16.

**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.

**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
- Valve controls
- Chemical treatment controls
- Ventilator 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 ½-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 ½-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.

• 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):

• Industrial Systems, Inc. – Portland, Oregon
• Olsson Industrial Electric – Springfield, Oregon
• Pacific Electrical Contractors (ORPAC) – Medford, Oregon
• The Automation Group (TAG) – Eugene, Oregon
• Taurus Power and Controls – Tualatin, Oregon

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 200-mile drive from the City of Roseburg.

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) 951-5386. 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, operator interface, and HMI Computer System.

• 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.

**Part 2 – Products**

**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:

• Chemical Filling Station High Level Alarm Panel

• Ventilation Control 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

17.11 Panel Certifications

Part 1 – General

Design Requirements
Panels provided for this project shall meet the requirements of UL-508 for water system and UL-913 for sewer system. 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.

17.12 Equipment Panels

Part 1 – General

References
Division 10.14.8 Electrical and control signs and labels. All panels shall be labeled.

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.

Part 2 – Products

Components

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. Protection equipment shall consist of circuit breakers and fuses to protect electrical circuits from short circuits and overloads.
Part 2 – Products

Manufacturers

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.

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 $\frac{1}{16}$-inch minimums to $\frac{3}{4}$-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 amperes; (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.

**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.

**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.
17.90 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 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 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
collection 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 one training session, each at least 2 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 and 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.
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.
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; move all personnel and equipment off site after contract completion; 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 total contract.

**Bid Item 2– Bulk Sodium Hypochlorite Chlorination System**

Lump sum price shown shall cover the complete cost of providing all labor, materials, equipment and incidentals necessary for the bulk sodium hypochlorite chlorination system as shown on the Plans and detailed in the contract specifications. This work shall include but is not limited to: demolition of the existing disinfection system; cast-in-place concrete and supports; bulk storage tank placement and installation; chemical transfer pump system complete; day tank placement and installation; sodium hypochlorite metering pumps and feed system complete; ventilation modifications; safety shower eyewash and minor mechanical modifications; all associated piping, valves, fittings and appurtenances required for a complete system; and all other site, structural and mechanical work not covered elsewhere. Payment shall be lump sum.

**Bid Item 3– Chlorination Carrier Water Replacement**

Lump sum price shown shall cover the complete cost of providing all labor, materials, equipment and incidentals necessary for the replacement of the chemical carrier water piping as shown on the Plans and detailed in the contract specifications. This work shall include but is not limited to: demolition of the existing carrier water piping; furnishing and installing carrier water piping and fittings of the size, type and class specified; all associated valves, fittings, supports and appurtenances required for a complete system.
No payment will be made for the piping until it has been inspected and tested where applicable. No more than 90 percent of the total for each bid item will be paid prior to the satisfactory completion of all carrier pipe pressure testing, disinfecting and flushing, and bacteriological testing for that bid item. Payment shall be lump sum.

**Bid Item 4 – Electrical**

The lump sum price shown 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. This bid item includes the installation of instrumentation, control panels, site and facility electrical and signal conduits, conductors, junction boxes, coordination with automatic control system integrator and programmer, and all other electrical work not covered elsewhere. Payment shall be lump sum.

**Bid Item 5– Telemetry and Automatic Control**

Lump sum price shown shall cover the complete cost of providing all labor, materials, and equipment necessary for the automatic control system as shown on the Plans, and detailed in the contract specifications. Payment shall be lump sum.

**Bid Item 6– Construction Records and O&M Manuals**

Lump sum price shown shall cover the complete cost of providing all mark-up plans necessary for the Owner to create accurate as-built records as detailed in the specifications. The work includes records of all mechanical and electrical equipment for maintenance purposes, and operation and maintenance (O&M) manuals. The price for this work will be $3,000. Any additional costs anticipated or incurred by the Contractor for the work shall be included in the various lump sum and unit price bid items as found in the proposal. Failure to comply with the as-built requirements and furnish acceptable as-built records will result in the deletion of this bid item by change order.

Payment for this work will not be made prior to the final payment. Payment shall be lump sum.

**Bid Item 7– Testing, Startup and Training**

The lump sum price shown shall cover the complete cost of testing, start-up, operation demonstration, and training and shall include all costs of providing the manufacturer’s local representatives who shall be available to attend the testing, start-ups, and operation demonstration of all the equipment, including electrical and telemetry equipment, and to lubricate, monitor, adjust, balance, and ensure normal operating function of each piece of equipment as often as required to provide a normal operating system. The lump sum price shall also include all costs incidental to training the Owner’s staff on the operation and maintenance of the equipment installed including electrical and telemetry equipment as part of this project. A lump sum price of $7,000 has been included in the proposal for this work. Any additional costs anticipated or incurred by the Contractor for the work shall be included in the various lump sum bid items as found in the proposal. Partial payment will not be allowed. Payment shall be lump sum.