SET NO. _____

PROJECT MANUAL

CITY OF LOUISVILLE

HOWARD BERRY AND SID COPELAND WATER TREATMENT PLANTS
CHLORINE DIOXIDE FEED SYSTEMS REPLACEMENT

APRIL 2025

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CITY OF LOUISVILLE

HOWARD BERRY AND SID COPELAND WATER TREATMENT PLANTS
CHLORINE DIOXIDE FEED SYSTEMS REPLACEMENT

JVA, Inc.
1319 Spruce Street
Boulder, CO 80302

JVA Job No. 240879.ENV

APRIL 2025

PROJECT MANUAL

TABLE OF CONTENTS

CITY OF LOUISVILLE
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CHLORINE DIOXIDE FEED SYSTEMS REPLACEMENT

Section No.	**Subject**	**# of Pages**
DIVISION 0 – GENERAL CONDITIONS		
--	Invitation to Bid	2
--	Instructions to Bidders	9
--	Bid Form	36
--	General Conditions	56
DIVISION 1 – GENERAL REQUIREMENTS		
01010	Summary of Work	4
01039	Coordination and Meetings	6
01080	Identification Systems	3
01200	Payment Procedures	5
01340	Shop Drawings, Product Data, and Samples	13
01380	Construction Photographs	3
01400	Quality Control	5
01500	Construction Facilities and Temporary Controls	4
01600	Materials and Equipment	11
01650	Starting of Systems	2
01700	Contract Closeout	7
01730	Operation and Maintenance Data	6

DIVISION 3 – CONCRETE

03300	Cast-In-Place Concrete	17
03600	Grout	2

DIVISION 5 – METALS

05500	Metal Fabrications	5

DIVISION 6 – WOOD, PLASTICS, COMPOSITES

06525	Fiberglass Reinforced Plastic Fabrications	2

DIVISION 9 – FINISHES

09900	Coating	8

DIVISION 11 – EQUIPMENT

11321	Chlorine Dioxide Generator System - Installation Only	4

DIVISION 15 –MECHANICAL

15060	Pipe and Pipe Fittings	15
15090	Supports and Anchors	5
15100	Valves Cocks and Hydrants	15

DIVISION 16 – ELECTRICAL

16000	Common Work Results for Electrical	14

INVITATION TO BID

Bids will be received by the

CITY OF LOUISVILLE, STATE OF COLORADO

Hereinafter referred to as OWNER, at the office of Public Works, 749 Main Street, Louisville, Colorado 80027, for the

Sid Copeland Water Treatment Plant (SCWTP) & Howard Berry Water Treatment Plant (HBWTP) Chlorine Dioxide Feed Systems Replacement

The City of Louisville (City) is inviting bids from highly qualified contractors for the installation of new chlorine dioxide feed systems along with associated pumps, piping, electrical, and HVAC for the SCWTP & HBWTP in the City of Louisville, Colorado.

Bids will be accepted until **2:00 PM Mountain Time on May 9, 2025**. Late bids will not be accepted. Bids shall be submitted electronically via email to:

Justin Ferron, P.E.
Civil Engineer III
Office: 303-335-4607
Cell: 951-852-0344
jferron@louisvilleco.gov

The Work for which the Bid is requested for the permanent installation of replacement Chlorine Dioxide feed units at SCWTP and HBWTP. The main feed unit for each plant will be supplied by the City. This project consists of but is not limited to installation of concrete equipment pad, associated pumps/piping, electrical, and HVAC improvements. Installation will need to be coordinated with plant staff to minimize disruption to plant production particularly during peak summer months.

Digital copies of the Bid Documents will be available after **April 23, 2025** on-line through Rocky Mountain Bid System located on the City of Louisville's website: https://www.louisvilleco.gov/doing-business/bidding-opportunities-requests-for-proposals

A **mandatory** pre-bid conference and job walk through with representatives of prospective BIDDERs will be held at **10:00 a.m.,** MST at the SCWTP, 1955 Washington Ave., Louisville, Colorado, on **May 1, 2025**. Representatives of the City will be present to discuss the Project. Perspective BIDDERs are invited to attend and present their questions relative to this Bid at this conference. **Attendance at this pre-bid conference is required to submit a Bid.**

The City of Louisville reserves the right to award the Bids by parts, to reject any or all Bids, to waive any informalities and irregularities therein, and to accept the bid deemed to be from the lowest reliable and responsible bidder. Selection is also dependent on the negotiation of an acceptable contract with the successful bidder.

Bids will be received on a Unit price basis as described in the Bidding Documents.

The successful BIDDER will be required to furnish a performance bond and a labor and material payment bond to the City of Louisville guaranteeing faithful performance and the payment of all bills and obligations arising from the performance of the Contract.

No Bid may be withdrawn within a period of sixty (60) days after the date fixed for opening Bids.

Award of bid provisions are solely for the fiscal responsibility and benefit of the City of Louisville, and confer no rights, duties or entitlements to any bidders.

The City of Louisville assumes no responsibility for payment of any expenses incurred by any respondent to this Invitation to Bid.

Each Bid shall contain evidence of BIDDER'S qualification to do business in the state of Colorado or covenant to obtain such qualification.

Preference is hereby given to materials, supplies, and provisions produced, manufactured, or grown in Colorado, quality and price being equal to articles offered by competitors outside of the State. Whenever sources within the City of Louisville exist and are competitive, purchases may be made from local vendors. Bids may be awarded, as deemed appropriate solely within the discretion of the City, to local vendors in compliance with the City's purchasing policies.

The City of Louisville is an Equal Opportunity Employer.

1st Publication: April 23, 2025
2nd Publication: April 30, 2025

INSTRUCTIONS TO BIDDERS

1. DEFINED TERMS

Terms used in these Instructions to BIDDERs, which are defined in the General Conditions of this Manual have the meanings assigned to them in the General Conditions.

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

1.1 The term "BIDDER" means one who submits a Bid directly to OWNER, as distinct from a sub-bidder, who submits a bid to a BIDDER.

1.2 The term "ISSUING OFFICE" means the office from which the Bidding Documents are to be issued and where the bidding procedures are to be administered.

1.3 The term "SUCCESSFUL BIDDER" means the lowest, qualified, responsible and responsive BIDDER to whom OWNER (on the basis of OWNER's evaluation as hereinafter provided) makes an award.

1.4 The term "Bidding Documents" includes the Invitation to Bid, Instructions to Bidders, the Bid Form, and the Contract Documents (including all Addenda issued prior to receipt of Bids).

2. COPIES OF BIDDING DOCUMENTS

2.1 Complete sets of Bidding Documents stated in the Invitation to Bid may be obtained from the Issuing Office. No partial sets will be issued. The Bidding Documents may be examined at the locations identified in the Invitation to Bid.

2.2 Complete sets of Bidding Documents shall be used in preparing Bids; neither OWNER nor ENGINEER assumes any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.

2.3 OWNER and ENGINEER in making copies of Bidding Documents available on the above terms do so only for the purpose of obtaining Bids for the Work and do not confer a license or grant for any other use.

3. QUALIFICATION OF BIDDERS

3.1 Each Bid shall contain evidence of BIDDER's qualification to do business in the state of Colorado or covenant to obtain such qualification.

3.3 The apparent low BIDDER shall be required to show that he has handled former work of similar type and that no just claims are pending against such work. No Bid will be awarded to a BIDDER who is engaged on any other work, which would impair his ability to perform or finance this Work.

4. EXAMINATION OF CONTRACT DOCUMENTS AND SITE

4.1 It is the responsibility of each BIDDER before submitting a Bid:

4.1.1 To examine thoroughly the Contract Documents and related data identified in the Bidding Documents;

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

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

4.1.4 To study and carefully correlate BIDDER's knowledge and observations with the Contract Documents and other related data; and

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

4.2 BIDDERS are responsible for examining and determining for themselves the location and nature of the proposed Work, the amount and character of the labor and materials required therefor, and the difficulties, which may be encountered. BIDDERS may not rely on oral or written representations made by the OWNER, including any reports and drawings identified pursuant to paragraph 4.2.1 and subparagraphs thereof of the General Conditions, unless the OWNER has guaranteed in writing that such representation is factually accurate, and by submitting a Bid, each Bidder waives all liability for any error in any representation made by the OWNER to the BIDDER. BIDDERS shall, at BIDDER'S own expense, inspect the site and its surroundings and conduct such supplementary examinations, investigations, and tests concerning conditions at or contiguous to the site (including surface, and subsurface) which may affect cost, progress, performance, or furnishing of the Work or which relate to any aspect of the means, methods, techniques, sequences, or procedures of construction to be employed by BIDDER and safety precautions and programs incident thereto for performing the Work in accordance with the Contract Documents. By failing to make such an inspection, the BIDDER waives all rights to claim extra payment or time extensions due to unexpected conditions, which could have been determined had the site been reasonably inspected. If concealed or unknown conditions differ materially from those ordinarily encountered and generally recognized as inherent in the Work, or differ materially from the conditions indicated in the Contract Documents, then an equitable adjustment in the Contract Price or in the Contract Time will be allowed by change order as provided in Article 11 or Article 12 respectively of the General Conditions. By submitting a Bid, the BIDDER represents that the BIDDER'S observations at the site are not inconsistent with the requirements of the proposed Contract Documents, unless otherwise noted by the BIDDER.

4.2.1 Refer to General Conditions for identification of those reports of explorations and tests of subsurface conditions at or contiguous to the site, which have been utilized by ENGINEER in preparation of the Contract Documents. BIDDER may not rely upon the general accuracy of the "technical data" contained in such reports or upon non-technical data, interpretations, opinions or information contained in such reports or otherwise relating to the subsurface conditions at the site, nor upon the completeness thereof for the purposes of bidding or construction unless OWNER has guaranteed in writing that such data or representations are accurate.

4.2.2 Refer to General Conditions for identification of those drawings of physical conditions in or relating to existing surface and subsurface conditions (except Underground Facilities) which are at or contiguous to the site that have been utilized by ENGINEER in preparation of the Contract Documents. BIDDER may not rely upon the general accuracy of the "technical data" contained in such drawings or upon other data, interpretations, opinions or information shown or indicated in such drawings or otherwise relating to such structures, nor upon the completeness thereof for the purposes of bidding or construction unless OWNER has guaranteed in writing that such data or representations are accurate.

Copies of such reports and drawings will be made available by OWNER to any BIDDER on request. Those reports and drawings are not part of the Contract Documents, but the technical data contained therein upon which BIDDER is entitled to rely upon as factually accurate as provided in Paragraphs 4.2.1 of the General

Conditions. BIDDER is responsible for any interpretation or conclusion drawn from any "technical data" or any such data, interpretations, opinions or information.

4.3 Information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or contiguous to the site is based upon information and data furnished to OWNER by OWNERS of such Underground Facilities or others, and OWNER and ENGINEER do not assume responsibility for the accuracy or completeness thereof.

4.4 On request in advance, OWNER will provide each BIDDER access to the site to conduct such examinations, investigations, explorations, tests and studies as each BIDDER deems necessary for submission of a Bid. BIDDER shall fill all holes, clean up and restore the site to its former conditions upon completion of such explorations, investigations, tests and studies.

4.5 Reference is made to the General Conditions for the identification of the general nature of work that is to be performed at the site by OWNER or others (such as utilities and other prime contractors) that relates to work for which a Bid is to be submitted. On request, OWNER will provide to each BIDDER for examination access to or copies of Contract Documents (other than portions thereof related to price) for such work.

4.6 The submission of a Bid will constitute an incontrovertible representation by BIDDER that BIDDER has complied with every requirement of this Article 4, that the BIDDER warrants that it is familiar with all provisions of the Contract Documents, that without exception the Bid is premised upon performing and furnishing the Work required by the Contract Documents and applying the specific means, methods, techniques, sequences or procedures of construction that may be shown or indicated in or expressly required by the Contract Documents, **that BIDDER has given ENGINEER written notice of all conflicts, errors, ambiguities and discrepancies that BIDDER has discovered in the Contract Documents and the written resolutions thereof by ENGINEER is acceptable to BIDDER**, and that the Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performing and furnishing of the Work.

4.7 The provisions of 4.1 through 4.7 of this section, inclusive, do not apply to Asbestos, Polychlorinated biphenyl's (PCB's), Petroleum, Hazardous Waste or Radioactive Material covered by paragraph 4.5 of the General Conditions.

5. AVAILABILITY OF LANDS FOR WORK, ETC.

5.1 The lands upon which the Work is to be performed will be in both outdoor road right-of-way, outdoor private, and inside private commercial/residual structures. All additional lands and access thereto required for temporary construction facilities or storage of materials and equipment are to be obtained and paid for by CONTRACTOR. Easements for permanent structures or permanent changes in existing facilities are to be obtained and paid for by OWNER unless otherwise provided in the Contract Documents.

6. INTERPRETATIONS AND ADDENDA

6.1 All questions about the meaning or intent of the Bidding Documents are to be submitted in writing to the ENGINEER. Interpretation or clarifications considered necessary by ENGINEER in response to such questions will be issued only by Addenda mailed or delivered to all parties recorded by ENGINEER as having received Bidding Documents. Questions received less than five days prior to the date for opening of Bids may not be answered. Only questions answered by formal written Addenda will be binding. **Oral and other interpretations or clarifications will be without legal effect.**

6.2 Addenda may also be issued to modify the Bidding Documents as deemed advisable by ENGINEER.

7. BID SECURITY

7.1 Each Bid must be accompanied by a Bid Security consisting of a properly Certified Check, Cashier's Check, or Bid Bond on the form enclosed herewith, in the amount of five (5) percent of BIDDER's Total Bid Price, without conditions, payable to the City of Louisville, Colorado. The Bid Bond must be executed by a surety meeting the requirements of Paragraph 5.3 of the General Conditions. The cost of the Bid Security shall be included in the bid. The submission of the Bid and Bid Security is a pledge by the BIDDER that he will enter into an Agreement with the Owner on the terms stated in his Bid and will, if required, furnish required insurance certificates and bonds, covering the faithful performance of the Agreement and the payment of all obligations arising thereunder.

7.2 The Bid Security of the Successful BIDDER will be retained until such BIDDER has executed the Agreement, furnished the required contract security and met the other conditions of the Notice of Award, whereupon the Bid Security will be returned. If the successful BIDDER fails to execute, enter into or deliver an Agreement in accordance with an accepted bid proposal, or fails to furnish the required bonds or certificates, within ten (10) days from the mailing of the Notice of Award, or if the BIDDER has been guilty of collusion with other BIDDERS in submitting the Bid, the OWNER may annul the Notice of Award and the Bid Security shall be forfeited to and retained by the OWNER as liquidated damages and not as a penalty. By submitting the Bid security with the bid proposal, the BIDDER agrees to liquidated damages in the event the BIDDER fails to enter into the Agreement with the OWNER. The OWNER shall not have to prove actual damages suffered in order to retain the Bid Security as liquidated damages. The OWNER and the BIDDER agree that liquidated damages are appropriate because the anticipated actual damages are uncertain in amount and difficult to forecast accurately. The OWNER and the BIDDER agree that the amount of the Bid Security is a reasonable estimate of damages and not disproportionate to the anticipated loss or injury. The Bid Security of other BIDDER'S whom OWNER believes to have a reasonable chance of receiving the award may be retained by OWNER until the seventh day after the Effective Date of the Agreement whereupon Bid Security furnished by such BIDDER'S will be returned. Bid Security with Bids, which are not competitive will be returned within fourteen days after the Bid opening.

8. CONTRACT TIME

8.1 The number of days within which, or the dates by which, the Work is to be completed (the Contract Time) is set forth in the Agreement.

9. LIQUIDATED DAMAGES

9.1 Provisions for liquidated damages, if any, are set forth in the Agreement and General Conditions.

10. SUBSTITUTE AND "OR-EQUAL" ITEMS

10.1 The Contract, if awarded, will be on the basis of materials and equipment described on the Drawings or specified in the Specifications without consideration of possible substitute or "or equal" items. Whenever it is indicated on the Drawings or specified in the Specifications that a substitute or "or - equal" item of material or equipment may be furnished or used by CONTRACTOR if acceptable to ENGINEER, application for such acceptance will not be considered by ENGINEER until after the Effective Date of the Agreement. The procedure for submission of any such application by CONTRACTOR and consideration by ENGINEER is set forth in paragraphs 6.7.1, 6.7.2 and 6.7.3 of the General Conditions and may be supplemented in the General Requirements.

11. SUBCONTRACTORS, SUPPLIERS AND OTHERS

11.1 **When a BIDDER submits a Bid, that Bid shall include the Schedule of Subcontractors, which shall identify each element of the Work to be subcontracted. Subcontractors whose subcontract exceeds ten percent of the Total Bid Price shall be prequalified by the City of Louisville, City Engineer for their specific portion of the Work.**

11.2 If OWNER, who after due investigation has reasonable objection to any proposed Subcontractor, other person or organization, may before the Notice of Award is given, request the apparent Successful BIDDER to submit a substitute Subcontractor acceptable to the City without an increase in Bid price. If the apparent Successful BIDDER declines to make any such substitution, OWNER may award the contract to the next lowest BIDDER that proposes to use acceptable Subcontractors and other persons and organizations. The declining to make requested substitutions will not constitute grounds for sacrificing the Bid security of any BIDDER. Any Subcontractor or other person or organization listed and to whom OWNER does not make written objection prior to the giving of the Notice of Award will be deemed acceptable to OWNER subject to revocation of such acceptance after the Effective Date of the Agreement as provided in Paragraph 6.8.2. of the General Conditions.

11.3 CONTRACTOR shall not be required to employ any Subcontractor, Supplier, other person or organization against whom CONTRACTOR has reasonable objection.

11.4 The Contract Documents will take precedence over any nonconforming data submitted. Any Bid specifically conditioned upon furnishing equipment or materials, which are not responsive to the Contract Documents will not be considered.

12. BID FORM

12.1 The Bid Form is included in the Contract Documents.

12.2 All blanks on the Bid Form must be completed by printing in ink or by typewriter. All unit prices including lump sums in the unit price schedule are to be expressed in numerals only.

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

12.4 Bids by partnerships must be executed in the partnership name and signed by a duly authorized general partner, whose title must appear under the signature and the official address of the partnership must be shown below the signature. A partnership shall give the full names and addresses of all partners and their interest and role in the partnership business.

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

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

12.7 The BIDDER's business address and telephone number for communications regarding the Bid must be shown.

12.8 Each Bid shall contain evidence of BIDDER's qualification to do business in the state of Colorado or covenant to obtain such qualification.

12.9 No alterations in Bids, or in the printed forms therefor, by erasures, interpolations, or otherwise will be accepted unless each such alteration is signed or initialed by the BIDDER; if initialed, OWNER may require the BIDDER to identify any alteration so initialed.

12.10 Bids will be based on a combination of unit price and lump sum schedules including alternatives. Unit price schedules shall be bid as provided in Paragraph 12.10.1 below. Lump sum schedules shall be bid as provided in paragraph 12.10.2 below.

12.10.1 Bids for unit price schedules shall be based on a unit price basis. The Total Bid Price will be determined as the sum of the products of the estimated quantity of each item and the unit price set forth in the Schedule of Unit Prices. The final Contract Price will be subject to adjustment according to final measured, used or delivered quantities as provided in the Specifications and the unit prices in the Bid Form will apply to such final quantities except that unit prices may be subject to change by Change Order if quantities vary more than 25 percent.

12.10.2 Bids for lump sum schedules shall be based on a lump sum basis for each lump sum item.

13. SUBMISSION OF BIDS

13.1 Bids shall be submitted at the time and place indicated in the Advertisement of Invitation to Bid and shall be submitted electronically via email to: jferron@louisvilleco.gov

13.2 Bids shall be deposited at the designated location prior to the time and date for receipt of Bids indicated in the Invitation to Bid, or any extension thereof made by Addendum. Bids received after the time and date for receipt of Bids will be returned unopened. BIDDER shall assume full responsibility for timely delivery at the location designated for receipt of Bids.

13.3 Oral, telephonic, or telegraphic Bids are invalid and will not receive consideration.

13.4 No BIDDER may submit more than one Bid. Multiple Bids under different names will not be accepted from one firm or association.

14. MODIFICATION AND WITHDRAWAL OF BIDS

14.1 Bids may be modified or withdrawn by an appropriate document duly executed (in a manner that a Bid must be executed) and delivered to the place where Bids are to be submitted at any time prior to the opening of Bids.

14.2 Bids may also be modified or withdrawn in person by the BIDDER or an authorized representative provided he can prove his identity and authority.

14.3 Withdrawn Bids may be resubmitted up to the time designated for the receipt of Bids provided that they are then fully in conformance with these Instructions to BIDDERs.

14.4 If, within twenty-four hours after Bids are opened, any BIDDER files a duly signed, written notice with OWNER and promptly thereafter demonstrates to the reasonable satisfaction of OWNER that there was a material and substantial mistake in the preparation of its Bid, that BIDDER may withdraw its Bid and the Bid security will be returned. Thereafter, that BIDDER will be disqualified from further bidding on the Work to be provided under the Contract Documents.

15. OPENING OF BIDS

15.1 Bids will be opened and (unless obviously non-responsive) read aloud publicly as indicated in the Invitation to Bid. An abstract of the amounts of the base Bids and major alternates (if any) will be made available to BIDDERS.

16. BIDS TO REMAIN OPEN SUBJECT TO ACCEPTANCE

16.1 All Bids shall remain open for sixty (60) days after the day of the Bid opening, but OWNER may, in its sole discretion, release any Bid and return the Bid Security prior to that date.

17. AWARD OF CONTRACT

17.1 OWNER reserves the right to reject any or all Bids, including without limitation the rights to reject any or all irregular, nonconforming, nonresponsive, unbalanced or conditional Bids and to reject the Bid of any BIDDER if OWNER believes that it would not be in the best interest of the Project to make an award to that BIDDER, whether because the Bid is not responsive or the BIDDER is unqualified or of doubtful financial ability or fails to meet any other pertinent standard or criteria established by OWNER. Discrepancies between the multiplication of units of Work and unit prices will be resolved in favor of the unit prices. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum.

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

17.3 OWNER will consider the qualifications and experience of Subcontractors and other persons and organizations proposed for those portions of the Work as to which the identity of Subcontractors and other persons and organizations must be submitted. OWNER also will consider the operating costs, maintenance requirements, performance data and guarantees of major items of materials and equipment proposed for incorporation in the Work when such data is required to be submitted prior to the Notice of Award.

17.4 OWNER may conduct such investigations as OWNER deems necessary to assist in the evaluation of any Bid and to establish the responsibility, qualifications and financial ability of the BIDDER, proposed Subcontractors and other persons and organizations to perform and furnish the Work in accordance with the Contract Documents to OWNER's satisfaction within the prescribed time.

17.5 If the contract is to be awarded, it will be awarded to the lowest responsible BIDDER based on the combination of Bid Schedules as determined by OWNER and whose evaluation by OWNER indicates to OWNER that the award will be in the best interest of the Project.

17.6 If the contract is to be awarded, OWNER will accept the Bid within sixty days after the Bid opening and will give the Successful BIDDER a Notice of Award within sixty-five days after the day of the Bid opening. The OWNER's acceptance of the Bid proposal shall bind the successful BIDDER to sign the Contract Documents within ten (10) days after the date of the receipt by the BIDDER of the Notice of Award. The rights and obligations set forth in the Contract Documents shall become effective only with the signature of the **MAYOR** on behalf of the City.

17.7 It is the OWNERS intention to award the entire contract as bid. The OWNER reserves the right to award a contract that is in the best interest of the OWNER and within the amount budgeted and that the OWNER has appropriated monies at least equal to the contract amount. The Total Bid Price shall be the basis of award. Quantities may be reduced in order to reach budget amount, in that case the unit prices shall govern to determine the lowest Total Bid Price, which shall then determine the basis of award. If quantity reductions are required, quantities may be reduced from any item.

The BIDDER acknowledges that the OWNER has the right to delete any item of the Schedule of Unit Prices or change quantities and locations in any item at OWNERS sole discretion without affecting the contract prices of any item of the Contract so long as the deletion or change does not exceed twenty-five (25) percent of the Total Bid Price.

Quantities listed in the Schedule of Unit Prices are approximate and are for the purpose of comparing bids. These quantities have been estimated and are for the general information of the BIDDER. Quantities are not guaranteed.

17.8 In addition to Paragraph 17.1 of the Instructions to Bidders, in evaluating Bids, the OWNER will consider Bids irregular, and intends to reject Bids, for any of the following substantial reasons:

17.8.1 Unsigned Bid Form;

17.8.2 Bid Forms which have items omitted by the BIDDER;

17.8.3 Altering a Bid as to specified time of commencement of completion of Work;

17.8.4 Bid Forms not accompanied by a Bid Security of character indicated or of an amount less than indicated;

17.8.5 If the Bid Form is on a form other than that provided in Contract Documents, or if the Bid Form is altered;

17.8.6 If there are unauthorized additions, conditional or alternate Bids, or discrepancies of any nature that make the Bid Form incomplete, indefinite, or ambiguous as to its meaning;

17.8.7 If the BIDDER adds any provisions reserving the right to accept or reject an award, or to enter into a Contract pursuant to an award;

17.8.8 If the Schedule of Unit Prices in the Bid Form does not contain a unit price for each item number listed; or,

17.8.9 Submitting more than one Bid, where there is evidence that any BIDDER has an interest in more than one Bid for the same work, or where there is evidence of collusion or other illegal activities between BIDDERS. In addition to any other remedies the OWNER may have, the OWNER may retain as liquidated damages for the disruption of the bidding process the Bid Security of all bidders involved in collusion or other illegal activities. The BIDDER and the OWNER agree that the amount of the Bid Security is a reasonable estimate of damages for collusion and other illegal activities on the part of the BIDDER and not disproportionate to the anticipated loss or injury. A person or entity, which has quoted prices to a BIDDER is not hereby disqualified from quoting prices to other BIDDERS or from submitting a direct bid on its own behalf.

17.9.0 In evaluating Bids, the OWNER may consider Bids informal, and may, in its sole discretion, elect to waive informalities for the following minor reasons:

17.9.1 Omission of dates when signed, or title of person signing;

17.9.2 Failure to acknowledge an addendum, which does not affect quantity, quality, time, or price;

17.9.3 Submission of a Bid in an unsealed envelope;

17.9.4 Unit price Bids which include reconcilable arithmetic errors may be corrected if it does not change the unit price; or,

17.9.5 Unit price Bids which include reconcilable arithmetic errors may be corrected, if it does not change the amount on which the award will be based.

18. CONTRACT SECURITY

18.1 Paragraph 5.1 of the General Conditions set forth OWNER's requirements as to performance and payment Bonds. When the Successful BIDDER delivers the executed Agreement to OWNER it shall be accompanied by the required performance and payment Bonds.

19. SIGNING OF AGREEMENT

19.1 When OWNER gives a Notice of Award to the Successful BIDDER, it will be accompanied by the required number of unsigned counterparts of the Agreement with all other written Contract Documents attached. Within ten (10) days after CONTRACTOR's receipt of the Notice of Award, CONTRACTOR shall sign and have notarized the required number of counterparts of the Agreement and attached documents and return them to the OWNER along with the required Bonds, insurance certificates and power of attorney authorizations.

20. SPECIAL LEGAL REQUIREMENTS

20.1 OWNER's Finances. OWNER has made adequate financial arrangements for the completion of all Work required by the Contract Documents and welcomes inquiries from prospective BIDDERs on the prime contract.

21. SALES AND USE TAXES

21.1 OWNER is exempt from Colorado State Sales and Use Taxes on materials and equipment to be incorporated in the Work. Said taxes shall not be included in the Contract Price. Refer to General Conditions 6.15 for additional information.

22. RETAINAGE

22.1 Provisions concerning retainage and CONTRACTORS' rights to deposit securities in lieu of retainage are set forth in the Agreement.

23. MISTAKES IN BIDDING INSTRUCTIONS

23.1 If the OWNER makes a mistake in drafting the Instructions to Bidders or any other Contract Documents, the OWNER reserves the right to reject any or all Bids, or to require that BIDDERS submit an alternate bid proposal with adjustments made to correct the error(s). Such errors will be set forth in an addendum. If the CONTRACTOR has already been selected and has started performing work under the contract, and the OWNER then discovers a mistake in the Contract Documents for which the OWNER is responsible, the OWNER may opt to reform the contract. If the mistake causes the Contractor to receive compensation for materials not used in the Work or for labor, which would not be required for the Work, the Contract Price shall be decreased proportionally. If the mistake causes the CONTRACTOR to fail to bid on work, which must be performed in order to properly complete the contract, the OWNER may increase the Contract Price to equal the proportionate increase in the cost of required materials and labor caused to the CONTRACTOR. In the alternative, the OWNER may solicit bids for such additional work, or the OWNER may reassign such additional work to another CONTRACTOR, as the OWNER deems appropriate. Nothing in this provision shall apply to mistakes made by the CONTRACTOR in completing the Bid Form or in performing the contract.

BID FORM

PROJECT: HOWARD BERRY AND SID COPELAND WATER TREATMENT PLANTS CHLORINE DIOXIDE FEED SYSTEMS REPLACEMENT
PROJECT NUMBER: 501498-640167
OWNER: CITY OF LOUISVILLE, COLORADO

THIS BID IS SUBMITTED TO: THE CITY OF LOUISVILLE, COLORADO

1. The undersigned BIDDER proposes and agrees, if this Bid is accepted, to enter into an Agreement with OWNER in the form included in the Contract Documents to perform and furnish all Work as specified or indicated in the Contract Documents for the Contract Price and within the Contract Time indicated in this Bid and in accordance with the other terms and conditions of the Contract Documents.

2. BIDDER accepts all of the terms and conditions of the Invitation to Bid and Instructions to Bidders, including without limitation those dealing with the disposition of Bid Security. This Bid will remain subject to acceptance for sixty days after the day of Bid opening. BIDDER will sign and submit the Agreement with the Bonds and other documents required by the Bidding Requirements within ten days after the date of OWNER's Notice of Award.

3. In submitting this Bid, BIDDER represents, as more fully set forth in the Agreement, that:

   (a) BIDDER has examined copies of all the Bidding Documents and of the following Addenda receipt of all which is hereby acknowledged: (List Addenda by Addendum Number and Date):

Date	Number
_____	_____
_____	_____

   (b) BIDDER has familiarized itself with the nature and extent of the Contract Documents, Work, site, locality, and all local conditions and Laws and Regulations that in any manner may affect cost, progress, performance or furnishing of the Work.

   (c) BIDDER has studied carefully all reports and drawings of subsurface conditions and drawings of physical conditions which are identified in the General Conditions as provided in paragraph 4.2, and accepts the determination set forth in paragraph 4.2 of the General Conditions. BIDDER has inspected the site and has obtained conducted and carefully studied (or assumes responsibility for obtaining and carefully studying) all examinations, investigations, explorations, tests and studies which pertain to the subsurface or physical conditions at the site or otherwise may affect the cost, progress, performance or furnishing of the Work as BIDDER considers necessary for the performance or furnishing of the Work at the Contract Price, within the Contract Time and in accordance with the other terms and conditions of the Contract Documents, including specifically the provisions of paragraph 4.2 of the General Conditions; and no additional examinations, investigations, explorations, tests, reports or similar information or data are or will be required by BIDDER for such purpose.

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

(e) BIDDER has correlated the results of all such observations, examinations, investigations, explorations, tests, reports and studies with the terms and conditions of the Contract Documents.

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

(g) This Bid is genuine and not made in the interest of or on behalf of any undisclosed person, firm or corporation and is not submitted in conformity with any agreement or rules of any group, association, organization or corporation; BIDDER has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid; BIDDER has not solicited or induced any person, firm or corporation to refrain from bidding; and BIDDER has not sought by collusion to obtain for himself any advantage over any other Bidder or over OWNER.

4. BIDDER will complete the Work in accordance with Contract Documents for the following price(s):

SCHEDULE OF UNIT PRICES

PROJECT: HOWARD BERRY AND SID COPELAND WATER TREATMENT PLANTS CHLORINE DIOXIDE FEED SYSTEMS REPLACEMENT
PROJECT NUMBER: 501498-640167
OWNER: CITY OF LOUISVILLE, COLORADO

ITEM	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL PRICE
1	Installation of Chlorine Dioxide Feed System at Howard Berry WTP as described in the contract documents	LS	1	$	$
2	Installation of Chlorine Dioxide Feed System at Sid Copeland WTP as described in the contract documents	LS	1	$	$

BASE BID PRICE (Items 1 + Item 2): **$**_____
(figures)

Unit Prices have been computed in accordance with paragraph 11.9.2 of the General Conditions.

BIDDER acknowledges that quantities are not guaranteed and final payment will be based on actual quantities determined as provided in the Contract Documents.

5. BIDDER agrees that the Work;

   will be substantially complete and completed and ready for final payment in accordance with paragraph 14.13 of the General Conditions on or before the dates or within the number of Contract Days indicated in the Agreement.

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

6. The following documents are attached to and made a condition of this Bid:

   (a) Required Bid Security;

   (b) A list of Subcontractors and other persons and organizations proposed to perform the Work are required to be identified on the Schedule of Subcontractors and submitted in this Bid;

   (c) Anti-Collusion Affidavit; and

   (d) If BIDDER is a partnership, a list of all partners, their addresses, and their interest and role in the partnership business.

7. Communications concerning this Bid shall be addressed to:
   The address of BIDDER indicated below.

   _____

   _____

   _____

8. Terms used in this Bid, which are defined in the General Conditions of the Construction Contract included as part of the Contract Documents, have the meanings assigned to them in the General Conditions.

SUBMITTED on _____, 2025.

If BIDDER is:

An Individual

By _____
(Individual's Name)

(SEAL)

doing business as _____

Business address: _____

_____

_____

Phone No.: _____

A Partnership

By _____
(Firm Name)

(SEAL)

_____
(General Partner)

Business address: _____

_____

_____

Phone No.: _____

A Corporation

By _____
(Corporation Name)

_____
(State of incorporation)

By _____
(Name of person authorized to sign)

_____
(Title)

(CORPORATE SEAL)

Attest _____
(Secretary)

Business address: _____

_____

_____

Phone No.:_____

Date of Qualification to do business: _____

A Joint Venture

By _____
(Name)

_____
(Address)

By _____
(Name)

_____
(Address)

Phone Number and Address for receipt of official communications

_____

_____

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

BID BOND

BIDDER (Name and Address):

_____
_____
_____

SURETY (Name and Address of Principal Place of Business):

_____
_____
_____

OWNER (Name and Address):

_____
_____
_____

BID:

BID DUE DATE: _____
PROJECT (Brief Description Including Location):

_____
_____
_____

BOND:

BOND NUMBER: _____
DATE: (Not later than Bid Due Date): _____
PENAL SUM: _____

IN WITNESS WHEREOF, Surety and Bidder, intending to be legally bound hereby, subject to the terms printed on the reverse side hereof, do each cause this Bid Bond to be duly executed on its behalf by its authorized officer, agent, or representative.

BIDDER	**SURETY**
_____(Seal)	_____(Seal)
Bidder's Name and Corporate Seal	Surety's Name and Corporate Seal
By: _____	By: _____
Signature and Title	Signature and Title (Attach Power of Attorney)
Attest: _____	Attest: _____
Signature and Title	Signature and Title

Note: (1) Above addresses are to be used for giving requiring notice.
(2) Any singular reference to Bidder, Surety, Owner or other party shall be considered plural where applicable.

1. Bidder and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to pay to Owner upon default of Bidder the penal sum set forth on the face of this Bond. Default of Bidder shall occur upon the failure of Bidder to deliver within the time required by the Bidding Documents the properly executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents and Contract Documents.

3. This obligation shall be null and void if:

   3.1. Owner accepts Bidder's Bid and Bidder delivers within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents and Contract Documents, or

   3.2. All bids are rejected by Owner, or

   3.3. Owner fails to issue a notice of award to Bidder within the time specified in the Bidding Documents (or any extension thereof agreed to in writing by Bidder and, if applicable, consented to by Surety when required by paragraph 5 hereof).

4. Payment under this Bond will be due and payable upon default of Bidder and within thirty (30) calendar days after receipt by Bidder and Surety of written notice of default from Owner, which notice will be given with reasonable promptness, identifying this Bond and the Project and including a statement of the amount due.

5. Surety waives notice of and any and all defenses based on or arising out of any time extension to issue notice of award agreed to in writing by Owner and Bidder, provided that the time for issuing notice of award including extensions shall not in the aggregate exceed 120 days from Bid Due Date without Surety's written consent.

6. No suit or action shall be commenced under this Bond prior to thirty (30) calendar days after the notice of default required in paragraph 4 above is received by Bidder and Surety, and in no case later than one year after Bid Due Date.

7. Any suit or action under this Bond shall be commenced only in a court of competent jurisdiction located in the state in which the Project is located.

8. Notice required hereunder shall be in writing and sent to Bidder and Surety at their respective addresses shown on the face of this Bond. Such notices may be sent by personal delivery, commercial courier or by United States Registered or Certified Mail, return receipt requested, postage pre-paid, and shall be deemed to be effective upon receipt by the party concerned.

9. Surety shall cause to be attached to this Bond a current and effective Power of Attorney evidencing the authority of the officer, agent or representative who executed this Bond on behalf of Surety to execute, seal and deliver such Bond and bind the Surety thereby.

10. This Bond is intended to conform to all applicable statutory requirements. Any applicable requirements of any applicable statute that has been omitted from this Bond shall be deemed to be included herein as if set forth at length. If any provision of the Bond conflicts with any applicable provision of any applicable statute, then the provision of said statue shall govern and the remainder of this Bond that is not in conflict therewith shall continue in full force and effect.

11. The term "bid" as used herein includes a bid, offer or proposal as applicable.

SCHEDULE OF SUBCONTRACTORS AND REFERENCES

PROJECT: HOWARD BERRY AND SID COPELAND WATER TREATMENT PLANTS CHLORINE DIOXIDE FEED SYSTEMS REPLACEMENT
PROJECT NUMBER: 501498-640167
OWNER: CITY OF LOUISVILLE, COLORADO

This Bid is based on subcontracting certain portions of the work to subcontractors as listed below.

Name: _____ Telephone No. _____
Address: _____ _____ _____
City: _____ State: _____ Zip Code: _____
Services/equipment to be provided: _____
_____
_____

Name: _____ Telephone No. _____
Address: _____ _____ _____
City: _____ State: _____ Zip Code: _____
Services/equipment to be provided: _____
_____
_____

Name: _____ Telephone No. _____
Address: _____ _____ _____
City: _____ State: _____ Zip Code: _____
Services/equipment to be provided: _____
_____
_____

Provide three (3) references that include the last two years *(attach additional sheets as needed).*

Name: _____ Telephone No. _____
Address: _____ _____ _____
City: _____ State: _____ Zip Code: _____
Services/equipment provided for: _____
_____
_____

Name: _____ Telephone No. _____
Address: _____ _____ _____
City: _____ State: _____ Zip Code: _____
Services/equipment provided for: _____
_____
_____

Name: _____ Telephone No. _____
Address: _____ _____ _____
City: _____ State: _____ Zip Code: _____
Services/equipment provided for: _____
_____

ANTI-COLLUSION AFFIDAVIT

PROJECT: HOWARD BERRY AND SID COPELAND WATER TREATMENT PLANTS CHLORINE DIOXIDE FEED SYSTEMS REPLACEMENT
PROJECT NUMBER: 501498-640167
OWNER: CITY OF LOUISVILLE, COLORADO

I hereby attest that I am the person responsible within my firm for the final decision as to the price(s) and amount of this Bid or, if not, that I have written authorization, enclosed herewith, from that person to make the statements set out below on his or her behalf of my firm.

I further attest that:

1. The price(s) and amount of this bid have been arrived at independently, without consultation, communication or agreement for the purpose or with the effect of restricting competition with any other firm or person who is a BIDDER or potential prime BIDDER.

2A. Neither the price(s) nor the amount of this Bid have been disclosed to any other firm or person who is a BIDDER or potential prime BIDDER on this project, and will not be so disclosed prior to bid opening.

2B. Neither the prices nor the amount of the Bid of any other firm or person who is a BIDDER or potential prime BIDDER on this project have been disclosed to me or my firm.

3A. No attempt has been made to solicit, cause or induce any firm or person who is BIDDER or potential prime BIDDER to refrain from bidding on this project, or to submit a Bid higher than the Bid of this firm, or any intentionally high or noncompetitive Bid or other form of complementary Bid.

3B. No agreement has been promised or solicited for any other firm or person who is a BIDDER or potential prime BIDDER on this project to submit an intentionally high, noncompetitive or other form of complementary bid on this project.

4. The Bid of my firm is made in good faith and not pursuant to any consultation, communication, agreement or discussion with, or inducement or solicitation by or from any firm or person to submit any intentionally high, noncompetitive or other form of complementary bid.

5. My firm has not offered or entered into a subcontract or agreement regarding the purchase or sale of materials or services from any firm or person, or offered, promised or paid cash or anything of value to any firm or person, whether in connection with this or any other project, in consideration for an agreement or promise by any firm or person to refrain from bidding or to submit any intentionally high, noncompetitive or other form of complementary bid or agreeing or promising to do so on this project.

6. My firm has not accepted or been promised any subcontract or agreement regarding the sale of materials or services to any firm or person, and has not been promised or paid cash or anything of value by any firm or person, whether in connection with this or any other project, in consideration for my firm's submitting any intentionally high, noncompetitive or other form of complementary bid, or agreeing or promising to do so, on this project.

7. I have made a diligent inquiry of all members, officers, employees, and agents of my firm with responsibilities relating to the preparation, approval or submission of my firm's bid on this project and have been advised by each of them that he or she has not participated in any communication, consultation, discussion, agreement, collusion, or other conduct inconsistent with any of the statements and representations made in this affidavit.

8. I understand and my firm understands that any misstatement in this affidavit is and shall be treated as a fraudulent concealment from the OWNER of the true facts relating to submission of bids for this contract.

I DECLARE UNDER PENALTY OF PERJURY IN THE SECOND DEGREE, AND ANY OTHER APPLICABLE STATE OR FEDERAL LAWS THAT THE STATEMENTS MADE ON THIS DOCUMENT ARE TRUE AND COMPLETE TO THE BEST OF MY KNOWLEDGE.

CONTRACTOR'S FIRM OR COMPANY NAME	SECOND CONTRACTOR'S FIRM OR COMPANY NAME (IF JOINT VENTURE)
BY: _____	BY: _____
TITLE: _____	TITLE: _____
DATE: _____	DATE: _____

SWORN BEFORE ME THIS _____ DAY OF, _____, 2025

NOTARY PUBLIC: _____ MY COMMISSION EXPIRES: _____

CERTIFICATION OF EEO COMPLIANCE

PROJECT: HOWARD BERRY AND SID COPELAND WATER TREATMENT PLANTS CHLORINE DIOXIDE FEED SYSTEMS REPLACEMENT
PROJECT NUMBER: 501498-640167
OWNER: CITY OF LOUISVILLE, COLORADO

Instructions: BIDDER's and Subcontractors must complete and submit this form with the Bid Form. This is required by the Equal Employment Opportunity Regulations 41 CFR 1.7 (b) (1).

1. ___ Yes ___ No	I have developed and have on file at each establishment an affirmative action program as required by 41 CFR Chapter 60, Part 60-2.
2. ___ Yes ___ No	I have participated in a previous contract/subcontract subject to the equal opportunity clause.
3. ___ Yes ___ No	I have filed with the Joint Reporting Committee, the Director, or the Equal Employment Opportunity Commission all reports due under the applicable filing requirements.

I declare under penalty of perjury in the second degree and any other applicable state or federal laws that the statements made in this document are true and complete to the best of my knowledge.

CONTRACTOR
___ **BIDDER** ___ **PROPOSED SUBCONTRACTOR**

BY: _____

TITLE: _____

DATE: _____

AGREEMENT

THIS AGREEMENT is made and entered into this _day of _____ in the year 2025 by and between:

CITY OF LOUISVILLE, COLORADO
(hereinafter called OWNER)

and

_____
(hereinafter called CONTRACTOR)

OWNER and CONTRACTOR, in consideration of the mutual covenants hereinafter set forth, agree as follows.

ARTICLE 1. WORK

CONTRACTOR shall complete all Work as specified or indicated in the Contract Documents. The Work is generally described as follows:

PROJECT: HOWARD BERRY AND SID COPELAND WATER TREATMENT PLANTS CHLORINE DIOXIDE FEED SYSTEMS REPLACEMENT
PROJECT NUMBER: 501498-640167

ARTICLE 2. CONTRACT TIMES

2.1 The CONTRACTOR shall substantially complete all work within **180 Consecutive Contract Days** after the date when the Contract Time commences to run. The Work shall be completed and ready for final payment in accordance with paragraph 14.13 of the General Conditions within **60 Consecutive Contract Days** after the date when the Contract Times commence to run. The Contract Times shall commence to run on the day indicated in the Notice to Proceed.

2.2 LIQUIDATED DAMAGES. The OWNER and the CONTRACTOR agree and recognize that time is of the essence in this contract and that the OWNER will suffer financial loss if the Work is not substantially complete by the date specified in paragraph 2.1 above, plus any extensions thereof allowed in accordance with the Article 12 of the General Conditions. OWNER and CONTRACTOR also agree that such damages are uncertain in amount and difficult to measure accurately. Accordingly, the OWNER and CONTRACTOR agree that as liquidated damages, and not as a penalty, for delay in performance the CONTRACTOR shall pay the OWNER **FIVE HUNDRED DOLLARS ($500)** for each and every **Contract Day** and portion thereof that expires after the time specified above for substantial completion of the Work until the same is finally complete and ready for final payment. The liquidated damages herein specified shall only apply to the CONTRACTOR's delay in performance, and shall not include litigation or attorneys' fees incurred by the OWNER, or other incidental or consequential damages suffered by the OWNER due to the CONTRACTOR's performance. If the OWNER charges liquidated damages to the CONTRACTOR, this shall not preclude the OWNER from commencing an action against the CONTRACTOR for other actual harm resulting form the CONTRACTOR's performance, which is not due to the CONTRACTOR's delay in performance.

ARTICLE 3. CONTRACT PRICE

3.1 The OWNER shall pay in current funds, and the CONTRACTOR agrees to accept in full payment for performance of the Work, subject to additions and deductions from extra and/or omitted work and determinations of actual quantities as provided in the Contract Documents, the Contract Price of _____dollars and 00/100 ($_____) as set forth in the Bid Form of the CONTRACTOR dated _____.

As provided in paragraph 11.9 of the General Conditions estimated quantities are not guaranteed, and determinations of actual quantities and classification are to be made by ENGINEER as provided in paragraph 9.10 of the General Conditions. Unit prices have been computed as provided in paragraph 11.9 of the General Conditions.

ARTICLE 4. PAYMENT PROCEDURES

CONTRACTOR shall submit Applications for Payment in accordance with Article 14 of the General Conditions. Applications for Payment will be processed by OWNER as provided in the General Conditions.

4.1 PROGRESS PAYMENTS. OWNER shall make progress payments on the basis of CONTRACTOR's Applications for Payment as recommended by ENGINEER, on or about the third Wednesday of each month during construction as provided below. All progress payments will be on the basis of the progress of the Unit Price Work based on the number of units completed as provided in the General Conditions.

4.1.1.1 Prior to Substantial Completion, progress payments will be made in the amount equal to 90 percent of the completed Work, and/or 90 percent of materials and equipment not incorporated in the Work (but delivered, suitably stored and accompanied by documentation satisfactory to OWNER as provided in 14.2 of the General Conditions), but in each case, less the aggregate of payments previously made and such less amounts as ENGINEER shall determine, or OWNER may withhold, in accordance with paragraph 14.7 of the General Conditions.

If Work has been 50 percent completed as determined by ENGINEER, and if the character and progress of the Work have been satisfactory to OWNER, OWNER may determine that as long as the character and progress of the Work remain satisfactory to them and no claims have been made by Subcontractors or material suppliers for unpaid work or materials, there will be no additional retainage on account of Work completed in which case the remaining progress payments prior to Substantial Completion may be in an amount equal to 100 percent of the Work completed.

Nothing contained in this provision shall preclude the OWNER and CONTRACTOR from making other arrangements consistent with C.R.S. 24-91-105 prior to contract award.

4.2 FINAL PAYMENT. Upon final completion and acceptance of the Work in accordance with paragraph 14.13 of the General Conditions, OWNER shall pay the remainder of the Contract Price as provided in said paragraph 14.13 of the General Conditions.

ARTICLE 5. CONTRACTOR'S REPRESENTATIONS

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

5.1 CONTRACTOR has examined and carefully studied the Contract Documents, (including the Addenda listed in paragraph 6.10) and the other related data identified in the Bidding Documents including "technical".

5.2 CONTRACTOR has inspected the site and become familiar with and is satisfied as to the general, local and site conditions that may affect cost, progress, performance or furnishing of the Work.

5.3 CONTRACTOR is familiar with and is satisfied as to all federal, state and local Laws and Regulations that may affect cost, progress and furnishing of the Work.

5.4 CONTRACTOR has carefully studied all reports of exploration and tests of subsurface conditions at or contiguous to the site and all drawings of physical conditions relating to surface or subsurface structures at or contiguous to the site (Except Underground facilities) which have been identified in the General Conditions as provided in paragraph 4.2.1 of the General Conditions. CONTRACTOR accepts the determination set forth in paragraph 4.2 of the General Conditions. CONTRACTOR acknowledges that such reports and drawings are not Contract Documents and may not be complete for CONTRACTOR's purposes. CONTRACTOR acknowledges that OWNER and ENGINEER do not assume responsibility for the accuracy or completeness of information and data shown or indicated in the Contract Documents with respect to such reports, drawings or to Underground Facilities at or contiguous to the site. CONTRACTOR has conducted, obtained and carefully studied (or assume responsibility for having done so) all necessary examinations, investigations, explorations, tests, studies, and data concerning conditions (surface, subsurface and Underground Facilities) at or contiguous to the site or otherwise which may affect cost, progress, performance or furnishing of the Work or which relate to any aspect of the means, methods, techniques, sequences and procedures of construction to be employed by CONTRACTOR and safety precautions and programs incident thereto. CONTRACTOR does not consider that any additional examinations, investigations, explorations, tests, studies or data are necessary for the performance and furnishing of the Work at the Contract Price, within the Contract Times and in accordance with the other terms and conditions of the Contract Documents.

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

5.6 CONTRACTOR is aware of the general nature of work to be performed by OWNER and others at the site that relates to the Work as indicated in the Contract Documents.

5.7 CONTRACTOR has correlated the information known to CONTRACTOR, information and observations obtained from visits to the site, reports and drawings identified in the Contract Documents and all additional examinations, investigations, explorations, tests studies and data with the Contract Documents.

5.8 CONTRACTOR has given ENGINEER written notice of all conflicts, errors, ambiguities or discrepancies that CONTRACTOR has discovered in the Contract Documents and the written

resolution thereof by ENGINEER is acceptable to CONTRACTOR, and the Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing the Work.

ARTICLE 6. CONTRACT DOCUMENTS

The Contract Documents, which constitute the entire agreement between OWNER and CONTRACTOR concerning the Work, are all written documents, which define the Work and the obligations of the Contractor in performing the Work and the OWNER in providing compensation for the Work. The Contract Documents include the following:

6.1 Invitation to Bid

6.2 Instruction to Bidders

6.3 Bid Form

6.4 This Agreement

6.5 General Conditions

6.6 Supplementary Conditions – N/A

6.7 General Requirements

6.8 Technical Specifications

6.9 Drawings

6.10 Change Orders, Addenda and other documents which may be required or specified including:

6.10.1 Addenda No. ___ to ___ exclusive
6.10.2 Documentation submitted by CONTRACTOR prior to Notice of Award.
6.10.3 Schedule of Subcontractors/References
6.10.4 Anti-Collusion Affidavit
6.10.5 Certification of EEO Compliance
6.10.6 Contractor's Pre-Contract Certification Regarding Employing Illegal Aliens
6.10.7 Notice of Award
6.10.8 Performance Bond
6.10.9 Labor and Material Payment Bond
6.10.10 Certificates of Insurance
6.10.11 Notice to Proceed
6.10.12 Contractor's Proposal Request
6.10.13 Contractor's Overtime Request
6.10.14 Field Order
6.10.15 Work Change Directive
6.10.16 Change Order
6.10.17 Application for Payment
6.10.18 Certificate of Substantial Completion
6.10.19 Claim Release
6.10.20 Final Inspection Report
6.10.21 Certificate of Final Completion
6.10.22 Guarantee Period Inspection Report

6.11 The following which may be delivered or issued after the Effective Date of the Agreement and are attached hereto: All Written Amendments and other documents amending, modifying, or supplementing the Contract Documents pursuant to paragraphs 3.5 and 3.6 of the General Conditions.

6.12 In the event of conflict between the above documents, the prevailing document shall be as follows:

1. Permits from other agencies as may be required.

2. Special Provisions and Detail Drawings.

3. Technical Specifications and Drawings. Drawings and Technical Specifications are intended to be complementary. Anything shown or called for in one and omitted in another is binding as if called for or shown by both.

4. Supplementary Conditions.

5. General Conditions.

6. City of Louisville Design and Construction Standards.

7. Reference Specifications.

In case of conflict between prevailing references above, the one having the more stringent requirements shall govern.

There are no Contract Documents other than those listed above in this Article 6. The Contract Documents may only be amended, modified or supplemented as provided in paragraphs 3.5 and 3.6 of the General Conditions.

ARTICLE 7. MISCELLANEOUS

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

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

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

ARTICLE 8. OTHER PROVISIONS

IN WITNESS WHEREOF, OWNER and CONTRACTOR have signed this Agreement in duplicate. One counterpart each has been delivered to OWNER and CONTRACTOR. All portions of the Contract Documents have been signed, initialed or identified by OWNER and CONTRACTOR.

This Agreement will be effective on _____, 2025.

OWNER: CITY OF LOUISVILLE, COLORADO

By: _____
Christopher M. Leh, Mayor

(CORPORATE SEAL)

Attest: _____
Genny Kline, City Clerk

Address for giving notices:

749 Main Street
Louisville, Colorado
80027

Attention: Justin Ferron, P.E.

CONTRACTOR: _____

By: _____

(CORPORATE SEAL)

Attest: _____

Address for giving notices:

_____
_____

Attention: _____

PERFORMANCE BOND

_____, as Principal, hereinafter called the Contractor, and

_____, as Surety, with general offices in

_____
a Corporation organized under the laws of the State of _____, and authorized to transact business in the State of Colorado, are hereby bound unto the City of Louisville, Colorado, as Obligee, hereinafter called the City, in the penal sum of _____ ($_____) in the United States currency, for the payment of which sum the Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally.

WHEREAS, the Contractor has entered into a written contract with the City dated _____, 2025, for _____ in accordance with plans and specifications contained in the Contract, a copy of which Contract is attached hereto and made a part hereof and is hereinafter referred to as the Contract;

NOW, THEREFORE, the conditions of this performance bond are such that, if the Contractor shall satisfactorily perform the Contract, then this bond shall be null and void; otherwise, the Surety shall promptly remedy the default, or shall promptly 1) Complete the Contract in accordance with its terms and conditions, or 2) Obtain a Bid or Bids for completing the contract in accordance with its terms and conditions, and upon determination by Surety of the lowest responsible bidder, or if the City elects, upon determination by the City and the Surety jointly of the lowest responsible bidder, arrange for a Contract between such Bidder and the City, and make available as work progresses (even though there should be a default or a succession of defaults under the Contract or Contracts of completion arranged under this paragraph) sufficient funds to pay the costs of completion plus liquidated damages additional costs pursuant to Section 12.2 of the General Conditions of the Contract less the balance of the contract price, but not exceeding the amount set forth in the first paragraph hereof. The term "balance of the contract price", as used in this paragraph, shall mean the total amount payable by the City to the Contractor under the Contract and any amendments thereto, less the amount paid by the City to Contractor.

In addition, if the Contractor or a subcontractor shall fail to duly pay for any labor, materials, team hire, sustenance, provisions, provender, or other supplies used or consumed by such Contractor or subcontractor in performance of the Contract, or shall fail to duly pay any person who supplies rental machinery, tools, or equipment, all amounts due as the result of the use of such machinery, tools or equipment in the prosecution of the Work, then the Surety shall pay the same in the amount not exceeding the sum specified in the bond together with interest at a rate of eight percent per annum.

In addition to the other conditions hereof, this bond shall include all provisions set forth in Section 38-26-106, C.R.S.

THE UNDERSIGNED SURETY for value received hereby agrees that no extension of time, change in, addition to, or other modification of the terms of the Contract of Work to be performed thereunder or the specifications of the Contract Documents shall in any way affect its obligation on this bond and the Surety does hereby waive notice of any such extension of time, change, addition, or modifications.

SIGNED AND SEALED this_____day of _____, 2025.

_____	_____
(Contractor)	**(Surety Company)**
By: _____	Address: _____
(President)	
_____	By: _____
(Attest)	(Attorney-in-fact)

LABOR AND MATERIAL PAYMENT BOND

BOND NUMBER:

KNOW ALL MEN BY THESE PRESENCES: that

(Firm) _____
(Address) _____
(an Individual), (a Partnership), (a Corporation), hereinafter referred to as "the Principal", and

(Firm)_____
(Address)_____
hereinafter referred to as "the Surety", are held and firmly bound unto the
CITY OF LOUISVILLE, 749 MAIN STREET, LOUISVILLE, COLORADO a Municipal Corporation, hereinafter referred to as "the Owner", in the penal sum of
_____ Dollars
($_____) in lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, successors and assigns, jointly and severally, firmly by these presents.

THE CONDITIONS OF THIS OBLIGATION are such that whereas the Principal entered into a certain Agreement with the Owner, dated the _____ day of _____, 2025, a copy of which is hereto attached and made a part hereof for the performance of

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

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

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

In addition to the other conditions hereof, this bond shall include all provisions set forth in Section 38-26-105, C.R.S.

IN WITNESS WHEREOF, this instrument is executed in (3) counterparts, each one of which shall be deemed an original, this _____ day of _____, 2025.

IN THE PRESENCE OF:

_____

_____

PRINCIPAL:

BY: _____

_____

(Title)

(Corporate Seal)

Addresses:

_____

_____

_____

IN THE PRESENCE OF:

_____

_____

OTHER PARTNERS:

By: _____

By: _____

IN THE PRESENCE OF:

_____

_____

SURETY:

By: _____

(Attorney-in fact)

Address:

(Surety Seal)

_____

_____

NOTE: Date of Bond must <u>not</u> be prior to date of Agreement.
If Contractor is a Partnership, all partners must execute Bond.

IMPORTANT: Surety Company must be authorized to transact business in the state of Colorado and be acceptable to the Owner.

NOTICE OF AWARD

DATED: _____

TO: _____
_____

PROJECT: HOWARD BERRY AND SID COPELAND WATER TREATMENT PLANTS CHLORINE DIOXIDE FEED SYSTEMS REPLACEMENT
PROJECT NUMBER: 501498-640167
OWNER: CITY OF LOUISVILLE, COLORADO

Please be advised that on _____, 2025, the City of Louisville, Colorado City Council awarded the HOWARD BERRY AND SID COPELAND WATER TREATMENT PLANTS CHLORINE DIOXIDE FEED SYSTEMS REPLACEMENT your company in the amount of $_____ per your qualified, low unit price bids. In accordance with the Contract Documents, you are required to execute two copies of the Agreement and return both copies with the required bonds and certificates of insurance within **10 days** of the date of this Notice of Award by _____, 2025.

Failure to comply with these conditions within the time specified will entitle OWNER to consider your bid abandoned, to annul this Notice of Award and to declare your Bid Security forfeited.

CITY OF LOUISVILLE, COLORADO	ACCEPTANCE OF NOTICE
By: _____ Justin Ferron, P.E.	By: _____
Title: Civil Engineer III _____	Title: _____

NOTICE TO PROCEED

DATED: _____

TO: _____
_____

PROJECT: HOWARD BERRY AND SID COPELAND WATER TREATMENT PLANTS CHLORINE DIOXIDE FEED SYSTEMS REPLACEMENT
PROJECT NUMBER: 501498-640167
OWNER: CITY OF LOUISVILLE, COLORADO

You are hereby notified that the Contract Time under the above Contract will commence to run on _____**, 2025**. On that date, you are to begin performing the Work in accordance with the Contract Documents and you are to complete the Work within **180 Contract Days** thereafter. The date of substantial completion of all Work is therefore _____**, 2025.**

CITY OF LOUISVILLE, COLORADO

By: _____
Justin Ferron, P.E.

Title: Civil Engineer III

ACKNOWLEDGEMENT

Receipt of the above Notice to Proceed in hereby acknowledged.

CONTRACTOR: _____

By: _____

Title: _____

Date: _____

CHANGE ORDER NO. _____

DATED: _____, 2025

PROJECT: HOWARD BERRY AND SID COPELAND WATER TREATMENT PLANTS CHLORINE DIOXIDE FEED SYSTEMS REPLACEMENT

AGREEMENT DATE: _____2025

PROJECT NUMBER: **501498-640167** OWNER: CITY OF LOUISVILLE, COLORADO

The following changes are hereby made to the Contract Documents:

Description: _____
_____
_____
_____

Purpose: _____
_____
_____
_____
_____

Attachments: _____
_____
_____
_____

ADJUSTMENT TO CONTRACT PRICE:

Original contract price	$_____
Set change previous Change Orders No. __ to __	$_____
Contract price prior to this Change Order	$_____
Net adjustment resulting from this Change Order (+/-)	$_____
Current contract price including this Change Order	$_____

ADJUSTMENT TO CONTRACT TIME:

Original contract time (days or date)
Net change previous Change Orders No. __ to __ (days)
Contract time prior to this Change Order (days or date)
Net Adjustment Resulting from this Change Order (days)
Current contract time including this Change Order (days or date)

Recommended:	Approved:	Accepted:
_____	CITY OF LOUISVILLE, COLORADO	_____
ENGINEER	OWNER	CONTRACTOR
By: _____	By: _____	By: _____
Date: _____	Date: _____	Date: _____

FIELD ORDER

No._____

TO: _____

PROJECT: HOWARD BERRY AND SID COPELAND WATER TREATMENT PLANTS CHLORINE DIOXIDE FEED SYSTEMS REPLACEMENT
PROJECT NUMBER: 501498-640167
OWNER: CITY OF LOUISVILLE, COLORADO

DATE ISSUED: _____

You are hereby directed and instructed to execute promptly minor variations in the Work by this Field Order as follows:

Attachments:

This form shall be used to authorize minor variations in the Work from the requirements of the Contract Documents, which do not include an adjustment in the Contract Price or the Contract Times.

CITY OF LOUISVILLE		**ACCEPTED BY CONTRACTOR**	
BY:	_____	BY:	_____
TITLE:	_____	TITLE:	_____
DATE:	_____	DATE:	_____

WORK CHANGE DIRECTIVE

No. _____

PROJECT: HOWARD BERRY AND SID COPELAND WATER TREATMENT PLANTS CHLORINE DIOXIDE FEED SYSTEMS REPLACEMENT
PROJECT NUMBER: 501498-640167
OWNER: CITY OF LOUISVILLE, COLORADO

DATE ISSUED: _____ EFFECTIVE DATE: _____

You are directed to proceed promptly with the following change(s):

Description:

_____
_____
_____

Purpose of Work Change Directive:

_____
_____
_____

Attachments (List documents supporting change):

_____
_____
_____

If a claim is made that the above change(s) have affected Contract Price of Contract Times any claim for a Change Order based thereon will involve one or more of the following methods of determining the effect of the change(s).

Method of determining change in Contract Price:

____ Unit Prices
____ Lump Sum
____ Other _____
_____
_____

Method of determining change in Contract Times:

____ Contractor's Records
____ Engineer's Records
____ Other _____
_____
_____

Estimated increase (decrease) in Contract Price:
$_____
If the change involves an increase, the estimated amount is not to be exceeded without further authorization.

Estimated increase (decrease) in Contract Times
Substantial Completion: _____days;
Ready for final payment: _____days.
If the change involves an increase, the estimated times are not to be exceeded without further authorization.

RECOMMENDED:

_____
ENGINEER

BY: _____

ACCEPTED:

_____
CONTRACTOR

BY: _____

WORK CHANGE DIRECTIVE INSTRUCTIONS

A. GENERAL INFORMATION

This document was developed for use in situations involving changes in the Work that, if not processed expeditiously, might delay the Project. These changes are often initiated in the field and may affect the Contract Price or the Contract Times. This is not a Change Order, but only a directive to proceed with Work that may be included in a subsequent Change Order.

For supplemental instructions and minor changes not involving a possible change in the Contract Price or the contract Times a Field Order may be used.

B. COMPLETING THE WORK CHANGE DIRECTIVE FORM

Engineer initiates the form, including a description of the items involved and attachments.

Based on conversations between Engineer and Contractor, Engineer completes the following:

METHOD OF DETERMINING CHANGE, IF ANY, IN CONTRACT PRICE. Mark the method to be used in determining the final cost of Work involved and the estimated net effect on the Contract Price. If the change involves an increase in the Contract Price and the estimated amount is approached before the additional or changed Work is completed, another Work Change Directive must be issued to change the estimated price or Contractor may stop the changed Work when the estimated price is reached. If the Work Change Directive is not likely to change the Contract Price, the space for estimated increase (decrease) should be marked "Not Applicable.

METHOD OF DETERMINING CHANGE, IF ANY, IN CONTRACT TIMES: Mark the method to be used in determining the change in Contract Times and the estimated increase or decease in Contract Times. If the change involves an increase in the Contract Times and the estimated times are approached before the additional or changed Work is completed, another Work Change Directive must be issued to change the times or Contractor may stop the changed Work when the estimated times are reached. If the Work Change Directive is not likely to change the Contract Times, the space for estimated increase (decrease) should be marked "Not Applicable".

Once authorized by Engineer a copy will be sent to Contractor. Price and Times may only be changed by Change Order signed by Owner and Contractor.

Once the Work covered by this directive is completed or final cost and times are determined, Contractor should submit documentation for inclusion in a Change Order.

THIS IS A DIRECTIVE TO PROCEED WITH A CHANGE THAT MAY AFFECT THE CONTRACT PRICE OR THE CONTRACT TIMES. A CHANGE ORDER, IF ANY, SHOULD BE CONSIDERED PROMPTLY.

INSERT APPLICATION FOR PAYMENT

CONTRACTOR'S PROPOSAL REQUEST

(Not a Change Order)

Date Submitted: _____, 2025 No. _____

TO: _____

PROJECT: HOWARD BERRY AND SID COPELAND WATER TREATMENT PLANTS CHLORINE DIOXIDE FEED SYSTEMS REPLACEMENT
PROJECT NUMBER: 501498-640167
OWNER: CITY OF LOUISVILLE, COLORADO

We hereby request the cost of the following proposed change in the Contract. A breakdown of the proposed cost is attached.

Description of the proposed change:

All work shall be in accordance with the terms, stipulations, and conditions of the Contract Documents. If the Work herein requested is approved by Change Order, the time of completion will be (increased), (decreased), (unchanged) by _____ calendar days.

New Substantial Completion Date: _____, 2025

This change will:

___ Increase the Contract by $_____
___ Decrease the Contract by $_____
___ No change in the Contract

SUBMITTED BY CONTRACTOR

BY: _____

DATE: _____

DATE: _____

CITY OF LOUISVILLE

___ Contractors Proposal Request Accepted

___ Contractors Proposal Request Not Accepted

BY: _____

DATE: _____

TITLE: _____

CONTRACTOR'S OVERTIME REQUEST

Date Submitted: _____, 2025

TO: _____

PROJECT: HOWARD BERRY AND SID COPELAND WATER TREATMENT PLANTS CHLORINE DIOXIDE FEED SYSTEMS REPLACEMENT
PROJECT NUMBER: 501498-640167
OWNER: CITY OF LOUISVILLE, COLORADO

We hereby request to perform work on overtime in accordance with the terms, stipulations, and conditions of the Contract Documents.

Requested date of overtime work: _____, 2025

Requested hours of overtime work: _____ (a. m./p. m.) to _____ (a. m./p. m.)

Description of proposed overtime work:

No extra payment will be paid to the CONTRACTOR by the OWNER due to labor overtime or other increased costs of performing the Work. Should the CONTRACTOR desire to work outside the hours of 6:00a.m. to 8:00p.m. the CONTRACTOR shall submit a written request to the ENGINEER 24 hours prior. If approval is given by ENGINEER to CONTRACTOR for authorized overtime work, ENGINEER's and ENGINEER's authorized personnel will charge overtime and other incidental administrative expenses necessary for performing inspections or operational coordination. The CONTRACTOR will be responsible to pay for all such rates and charges, and shall not be granted a Contract Price increase for such charges.

Hours of overtime work shall only be allowed from 8:00 p.m. to 10:00 p.m. Monday thru Sunday.

SUBMITTED BY CONTRACTOR

BY: _____

DATE: _____

TITLE: _____

CITY OF LOUISVILLE

____ Contractors Proposal Request Accepted

____ Contractors Proposal Request Not Accepted

BY: _____

DATE: _____

TITLE: _____

CLAIM RELEASE

PROJECT: HOWARD BERRY AND SID COPELAND WATER TREATMENT PLANTS CHLORINE DIOXIDE FEED SYSTEMS REPLACEMENT
PROJECT NUMBER: 501498-640167
OWNER: CITY OF LOUISVILLE, COLORADO

Application for Payment Number: _____
Application for Payment Amount: _____
Application for Payment Date: _____

For valuable consideration, the receipt and sufficiency of which is hereby acknowledged, the undersigned hereby releases the City of Louisville, Colorado, and waives all rights of the undersigned to file a claim for material, equipment, tools, machinery or services heretofore furnished for use in and for labor heretofore performed upon the construction, alteration, addition to or repair of the structure or improvements described in the Contract Documents as:

Project: City of Louisville _____

Description of Property: _____

Owner: City of Louisville, Colorado

We acknowledge that the foregoing is an adequate description of the real property and improvement inasmuch as the foregoing description is the description given in the Contract Documents, which govern the performance of the Work for which consideration has been received.

In executing this release, we certify that all claims for labor or materials, or both, furnished or performed by the undersigned or on our behalf by our material suppliers or subcontractors have been paid or that satisfactory arrangements for payment have been made.

In further consideration of the payment made or to be made to the undersigned and to induce said payment, we agree to defend and indemnify the City of Louisville from any claim or claims on the part of our material suppliers, laborers, employees, servants, and agents, or subcontractors arising from our work on this project, and we further agree to fully satisfy any such claim brought against the City of Louisville and reimburse the City of Louisville for any and all costs, including reasonable attorney fees, which it may incur as a result of such claims.

SUPPLIER OR SUBCONTRACTOR	**CONTRACTOR**
By: _____	By: _____
President	President
Date: _____	Date: _____

CERTIFICATE OF SUBSTANTIAL COMPLETION

TO: _____

PROJECT: HOWARD BERRY AND SID COPELAND WATER TREATMENT PLANTS CHLORINE DIOXIDE FEED SYSTEMS REPLACEMENT
PROJECT NUMBER: 501498-640167
OWNER: CITY OF LOUISVILLE, COLORADO

This Certificate of Substantial Completion applies to all Work under the Contract Documents or to the following specified parts thereof:

_____

_____

_____

The Work to which this Certificate applies has been inspected by authorized representatives of OWNER, and that Work is hereby declared to be substantially complete in accordance with the Contract Documents on

_____
DATE OF SUBSTANTIAL COMPLETION

A tentative list of items to be completed or corrected is attached hereto. This list may not be all-inclusive, and the failure to include an item in the list does not alter the responsibility of CONTRACTOR to complete all the Work in accordance with the Contract Documents. The items in the tentative list shall be completed or corrected by CONTRACTOR within **ten (10)** days of the issuance of this Certificate of Substantial Completion.

CONTRACTOR shall maintain all contractual responsibilities until Final Acceptance.

The following documents are attached to and made a part of this Certificate of Substantial Completion:

Attachments:

_____

_____

_____

(For items to be attached see definition of Substantial Completion as supplemented and other specifically noted conditions precedent to achieving Substantial Completion as required by the Contract Documents.)

This certificate does not constitute an acceptance of Work or start of the guarantee period nor its release of CONTRACTOR's obligation to complete the Work in accordance with the Contract Documents. Issuance of Substantial Completion does not commence the guarantee period with this certificate.

CITY OF LOUISVILLE, COLORADO		**ACCEPTED BY CONTRACTOR**	
BY:	_____	BY:	_____
TITLE:	_____	TITLE:	_____
DATE:	_____	DATE:	_____

FINAL INSPECTION REPORT

DATE: _____

TO: _____
_____

PROJECT: HOWARD BERRY AND SID COPELAND WATER TREATMENT PLANTS CHLORINE DIOXIDE FEED SYSTEMS REPLACEMENT
PROJECT NUMBER: 501498-640167
OWNER: CITY OF LOUISVILLE, COLORADO

The ENGINEER has performed final inspection of the Work, and accepts the Work subject to the Contractor's performance and completion of the following repairs, corrections and/or replacements:

All outstanding work and Punch List items are complete as of _____

_____

_____

_____

_____

_____

_____

The ENGINEER does/does not (circle one) hereby finally accept the Work and hereby certifies that the Contractor is eligible to receive final payment of the Work.

CITY OF LOUISVILLE, COLORADO	**CONTRACTOR**
BY: _____	BY: _____
TITLE: _____	TITLE: _____
DATE: _____	DATE: _____

CERTIFICATE OF FINAL COMPLETION

DATE: _____

TO: _____
_____

PROJECT: HOWARD BERRY AND SID COPELAND WATER TREATMENT PLANTS CHLORINE DIOXIDE FEED SYSTEMS REPLACEMENT
PROJECT NUMBER: 501498-640167
OWNER: CITY OF LOUISVILLE, COLORADO

This Certificate of Final Completion applies to all Work under the Contract Documents, or to the following specified parts thereof:

(specify) All work under the Contract Documents. _____

_____

_____

The Work to which this Certificate applies has been inspected by authorized representatives of the ENGINEER and the Work is hereby declared to be complete in accordance with the Contract Documents on

DATE OF FINAL COMPLETION

In consideration therefor, the OWNER agrees to make Final Payment to Contractor of all amounts retained by OWNER, except such amounts that are subject to verified claims pursuant to Section 38-26-107, C.R.S, if any.

CITY OF LOUISVILLE, COLORADO		**CONTRACTOR**	
BY:	_____	BY:	_____
TITLE:	_____	TITLE:	_____
DATE:	_____	DATE:	_____

GUARANTEE PERIOD INSPECTION REPORT

DATE: _____, 20__

TO: _____
_____

PROJECT: HOWARD BERRY AND SID COPELAND WATER TREATMENT PLANTS CHLORINE DIOXIDE FEED SYSTEMS REPLACEMENT
PROJECT NUMBER: 501498-640167
OWNER: CITY OF LOUISVILLE, COLORADO

The ENGINEER's authorized representative performed the guarantee period inspection on _____, 20 ___, which guarantee was originally due to expire on _____, 20___.

The ENGINEER hereby determines that the project has ___/ has not ___ satisfactorily met the conditions required to pass the guarantee period inspection.

The identified following items of Work are defective and must be repaired, corrected and/or replaced:

_____

_____

_____

_____

_____

The guarantee period shall be extended for the items listed above until the following date:

_____, 20__.

CITY OF LOUISVILLE, COLORADO		**CONTRACTOR**	
BY:	_____	BY:	_____
TITLE:	_____	TITLE:	_____
DATE:	_____	DATE:	_____

GENERAL CONDITIONS

ARTICLE 1 - DEFINITIONS

Wherever used in these General Conditions or in the other Contract Documents the following terms have the meanings indicated which are applicable to both the singular and plural thereof:

1.0 **Abnormal Weather** - Snowfall, rainfall, freezing temperatures, or wind conditions, in excess of those encountered in the project area of Boulder County during the past 10 years that necessitates cessation of Work and causes consequence to the project.

1.1 **Addenda** - Written or graphic instruments issued prior to the opening of Bids, which clarify, correct or change the Bidding Requirements or the Contract Documents.

1.2 **Agreement** - The written contract between OWNER and CONTRACTOR covering the Work to be performed; other Contract Documents are attached to the Agreement and made a part thereof as provided therein.

1.3 **Application for Payment** - The form accepted by ENGINEER which is to be used by CONTRACTOR in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.

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

1.5 **Bid** - The offer or proposal of the Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.

1.6 **Bidding Documents** - The advertisement or invitation to Bid, instructions to Bidders, the Bid form, and the proposed Contract Documents (including all Addenda issued prior to receipt of Bids).

1.7 **Bidding Requirements** - The advertisement or invitation to Bid, instructions to bidders, and the Bid form.

1.8 **Bonds** - Performance and Payment bonds and other instruments of security.

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

1.9.1 **Contract Day** – A Contract Day specifies that construction will be completed Monday through Sunday, excluding OWNER-observed holidays and Abnormal Weather days.

1.10 **Contract Documents** - The Agreement, Addenda (which pertain to the Contract Documents), CONTRACTOR's Bid (including documentation accompanying the Bid and any post Bid documentation submitted prior to the Notice Award) when attached as an exhibit to the Agreement, the Notice to Proceed, the Bonds, these General Conditions, the Supplementary Conditions, the Specifications and the Drawings as the same are more specifically identified in the Agreement, together with all Written Amendments, Change Orders, Work

Change Directives, Field Orders and ENGINEER's written interpretations and clarifications issued pursuant to paragraphs 3.5, 3.6.1, and 3.6.3 on or after the Effective Date of the Agreement. Shop Drawing submittals approved pursuant to paragraphs 6.26 and 6.27 and the reports and drawings referred to in paragraphs 4.2.1.1 and 4.2.2.2 are not Contract Documents.

1.11 **Contract Price** - The moneys payable by OWNER to CONTRACTOR for completion of the Work in accordance with the Contract Documents as stated in the Agreement (subject to the provisions of paragraph 11.9.1 in the case of Unit Price Work).

1.12 **Contract Times** - The numbers of days or the dates stated in the Agreement: (i) to achieve Substantial Completion, and (ii) to complete the Work so that it is ready for final payment as evidenced by ENGINEER's written recommendation of final payment in accordance with paragraph 14.13.

1.13 **CONTRACTOR** - The person, firm or corporation with whom OWNER has entered into the Agreement.

1.14 **Defective** - An adjective which when modifying the work refers to Work that is unsatisfactory, faulty or deficient, in that it does not conform to the Contract Documents, or does not meet the requirements of any inspection, reference standard, test or approval referred to in the Contract Documents, or has been damaged prior to ENGINEER's recommendation of final payment (unless responsibility for the protection thereof has been assumed by OWNER at Substantial Completion in accordance with paragraph 14.8 or 14.10).

1.15 **Drawings** - The drawings, which show the scope, extent and character of the Work to be furnished and performed by CONTRACTOR and which have been prepared or approved by ENGINEER and are referred to in the Contract Documents. Shop drawings are not Drawings as so defined.

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

1.17 **ENGINEER** - The word "ENGINEER" refers to the City of Louisville, Director of Public Works or his authorized representative, designated by the OWNER as its Engineering representative.

1.18 **OWNER'S Consultant** - A person, firm or corporation having a contract with OWNER to furnish services as OWNER's independent professional associate or consultant with respect to the Project and who is identified as such in the Supplementary Conditions.

1.19 **Field Order** - A written order issued by ENGINEER which orders minor changes in the Work in accordance with paragraph 9.5 but which does not involve a change in the Contract Price or the Contract Times.

1.20 **General Requirements** - Sections of Division 1 of the Specifications.

1.21 **Hazardous Waste** - The term Hazardous Waste shall have the meaning provided in Section 1004 of the Solid Waste Disposal Act (42 USC Section 6903) as amended from time to time.

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

1.23 **Liens** - Liens, charges, security interests or encumbrances upon real property or personal property.

1.24 **Milestone** - A principal event specified in the Contract Documents relating to an intermediate completion date or time prior to Substantial Completion of all the Work.

1.25 **Notice of Award** - The written notice by OWNER to the apparent successful bidder stating that upon compliance by the apparent successful bidder with the conditions precedent enumerated therein, within the time specified, OWNER will sign and deliver the Agreement.

1.26 **Notice to Proceed** - A written notice given by OWNER to CONTRACTOR (with a copy to ENGINEER) fixing the date on which the Contract Times will commence to run and on which CONTRACTOR shall start to perform CONTRACTOR's obligations under the Contract Documents.

1.27 **OWNER** - The public body or authority, corporation, association, firm or person with whom CONTRACTOR has entered into the Agreement and for whom the Work is to be provided.

1.28 **Partial Utilization** - Use by OWNER of a substantially completed part of the Work for the purpose for which it is intended (or a related purpose) prior to Substantial Completion of all the Work.

1.29 **PCBs** - Polychlorinated biphenyls.

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

1.31 **Plans** - The term plans as used in these Contract Documents shall have the same meaning as Drawings.

1.32 **Product** - Includes materials, equipment and systems.

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

1.34 **Provide** - Furnish and install specified materials and equipment, unless the context requires otherwise.

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

1.36 **Resident Project Representative** - The authorized representative of ENGINEER who may be assigned to the site or any part thereof.

1.37 **Samples** - Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and which establish the standards by which such portion of the Work will be judged.

1.38 **Shop Drawings** - All drawings, diagrams, illustrations, schedules and other data or information which are specifically prepared or assembled by or for CONTRACTOR and submitted by CONTRACTOR to illustrate some portion of the Work.

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

1.40 **Subcontractor** - An individual, firm or corporation having a contract with CONTRACTOR or with any other Subcontractor for the performance of a part of the Work at the site.

1.41 **Substantial Completion** - The Work (or a specified part thereof) has progressed to the point where, in the opinion of ENGINEER as evidenced by ENGINEER's definitive certificate of Substantial Completion, it is sufficiently complete, in accordance with the Contract Documents, so that the Work (or specified part) can be utilized for the purposes for which it is intended; or if no such certificate is issued, when the Work is complete and ready for final payment as evidenced by ENGINEER's written recommendation of final payment in accordance with paragraph 14.13. The terms "substantially complete" and "substantially completed" as applied to all or part of the Work refer to Substantial Completion thereof.

1.42 **Supplementary Conditions** - The part of the Contract Documents, which amends or supplements these General Conditions.

1.43 **Supplier** - A manufacturer, fabricator, supplier, distributor, material man or vendor having a direct contract with CONTRACTOR or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by CONTRACTOR or any Subcontractor.

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

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

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

1.47 **Work Change Directive** - A written directive to CONTRACTOR, issued on or after the Effective Date of the Agreement and signed by OWNER and recommended by ENGINEER, ordering an addition, deletion or revision in the Work, or responding to differing or unforeseen physical conditions under which the Work is to be performed as provided in paragraph 4.2 or 4.3 or emergencies under paragraph 6.23. A Work Change Directive will not change the Contract Price or the Contract Times, but is evidence that the parties expect that the change directed or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order following negotiations by the parties as to its effect, if any, on the Contract Price or Contract Times as provided in paragraph 10.2.

1.48 Written Amendment - A written amendment of the Contract Documents, signed by OWNER and CONTRACTOR on or after the Effective Date of the Agreement and normally dealing with the non-engineering or non-technical rather than strictly construction-related aspects of the Contract Documents.

ARTICLE 2 - PRELIMINARY MATTERS

Delivery of Bonds:

2.1 When CONTRACTOR delivers the executed Agreement to OWNER, CONTRACTOR shall also deliver to OWNER such Bonds and Certificates of Insurance as CONTRACTOR may be required to furnish in accordance with Article 5.

Copies of Documents:

2.2 OWNER shall furnish to CONTRACTOR up to four copies of the contract documents for the execution of the Work. Additional copies will be furnished, upon request, at the cost of reproduction.

Commencement of Contract Times; Notice to Proceed:

2.3 The Contract Times will commence to run on the day indicated in the Notice to Proceed. Timing and completion of the HOWARD BERRY AND SID COPELAND WATER TREATMENT PLANTS CHLORINE DIOXIDE FEED SYSTEMS REPLACEMENT required on or prior to 180 Contract Days from the contract commencement date. The OWNER has set the proposed project schedule and plans to implement the following schedule for this project. The CONTRACTOR shall be required to start construction on or before the start date listed below:

PROPOSED PROJECT SCHEDULE:

Pre-Bid Conference ..... May 1 2025
Bid Opening ..... May 9 2025
Contract Award by City Council ..... June 3 2025
Notice of Award Issued ..... June 6 2025
Bonds & Insurance Certificates Due ..... June 16 2025
Contract Agreement Executed ..... June 16 2025
Notice to Proceed Issued ..... June 16 2025
Pre-Construction Conference ..... June 16 2025
Contract Time Commences to run ..... June 16 2025
Substantial Completion ..... October 31 2025
Final Completion ..... December 31 2025

2.3.1 The Contractor shall substantially complete all work by **October 31, 2025** and within **120** consecutive contract days after the date when the Contract Time commences to run. Should work not be completed by the date and within the time period specified, the Owner shall access the Contractor liquidated damages in conformance with the Agreement, Article 2 – Contract Times, paragraph 2.2 Liquidated Damages.

Starting the Work:

2.4 CONTRACTOR shall start to perform the Work on the date when the Contract Times commence to run, but no Work shall be done at the site prior to the date on which the Contract Times commence to run.

Before Starting Construction:

2.5 Before undertaking each part of the Work, CONTRACTOR shall carefully study and compare the Contract Documents and check and verify pertinent figures shown thereon and all applicable field measurements. CONTRACTOR shall promptly report in writing to ENGINEER any conflict, error, ambiguity or discrepancy which CONTRACTOR may discover and shall obtain a written interpretation or clarification from ENGINEER before proceeding with any Work affected thereby; however, CONTRACTOR shall not be liable to OWNER or ENGINEER for failure to report any conflict, error, ambiguity or discrepancy in the Contract Documents, unless CONTRACTOR knew or reasonably should have known thereof.

2.6 Within ten days after the Effective Date of the Agreement (unless otherwise specified in the General Requirements), CONTRACTOR shall submit to ENGINEER for review:

2.6.1 a preliminary progress schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestone specified in the Contract Documents;

2.6.2 a preliminary schedule of Shop Drawing and Sample submittals which will list each required submittal and the times for submitting, reviewing and processing such submittal.

Preconstruction Conference:

2.7 Before any Work at the site is started, a conference attended by CONTRACTOR, ENGINEER and others as appropriate will be held to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in paragraph 2.6, procedures for handling Shop Drawings and other submittal, processing Applications for Payment and maintaining required records.

Initially Acceptable Schedules:

2.8 Unless otherwise provided in the Contract Documents, at least ten days before submission of the first Application for Payment a conference attended by CONTRACTOR, ENGINEER and others as appropriate will be held to review the Application for Payment for acceptability to ENGINEER. No progress payment shall be made to CONTRACTOR until the schedules are submitted to and acceptable to ENGINEER as provided below. The progress schedule will be acceptable to ENGINEER as providing an orderly progression of the Work to completion within any specified Milestones and the Contract Times, but such acceptance will neither impose on ENGINEER responsibility for the sequencing, scheduling or progress of the Work nor interfere with or relieve CONTRACTOR from CONTRACTOR's full responsibility therefor. CONTRACTOR's schedule of Shop Drawing and Sample submissions will be acceptable to ENGINEER as providing a workable arrangement for reviewing and processing the required submittals.

ARTICLE 3 - CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE

Intent:

3.1 The Contract Documents comprise the entire agreement OWNER and CONTRACTOR concerning the Work. The Contract Documents are complementary; what is called for by one is as binding as if called for by all. The Contract Documents will be construed in accordance with the law of the place of the Project.

3.2 It is the intent of the Contract Documents to describe a functionally complete Project (or part thereof) to be constructed in accordance with the Contract Documents. Any Work, materials or equipment that may reasonably be inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the intended result will be furnished and performed whether or not specifically called for. When words or phrases, which have a well-known technical or construction industry or trade meaning are used to describe Work, materials or equipment, such words or phrases shall be interpreted in accordance with that meaning. Clarifications and interpretations of the Contract Documents shall be issued by ENGINEER as provided in paragraph 9.4.

3.3 Reference to Standards & Specifications of Technical Societies; Reporting and Resolving Discrepancies:

3.3.1. Reference to standards, specifications, manuals or codes of any technical society, organization or association, or to the Laws or Regulations of any governmental authority, whether such reference be specific or by implication, shall mean the latest standard, specification, manual, code or Laws or Regulations in effect at the time of opening of Bids (or, on the Effective Date of the Agreement if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.

3.3.2 If, during the performance of the Work, CONTRACTOR discovers any conflict, error ambiguity or discrepancy within the Contract Documents or between the Contract Documents and any provision of any such Law or Regulation applicable to the performance of the Work or of any such standard, specification, manual or code or of any instruction of any Supplier referred to in paragraph 6.5, CONTRACTOR shall report it to ENGINEER in writing at once, and, CONTRACTOR shall not proceed with the Work affected thereby (except in an emergency as authorized by paragraph 6.23) until an amendment or supplement to the Contract Documents has been issued by one of the methods indicated in paragraph 3.5 or 3.6; provided, however, that CONTRACTOR shall not be liable to OWNER or ENGINEER for failure to report any such conflict, error, ambiguity or discrepancy unless CONTRACTOR knew or reasonably should have known thereof. Upon notification to the ENGINEER, the CONTRACTOR shall proceed with other parts of the Work not affected by the conflict, error, ambiguity or discrepancy.

3.3.3 Except as otherwise specifically stated in the Contract Documents or as may be provided by amendment or supplement thereto issued by one of the methods indicated in paragraph 3.5 or 3.6, the provisions of the Contract Documents shall take precedence in resolving any conflict, error, ambiguity or discrepancy between the provisions of the Contract Documents and:

3.3.3.1 the provisions of any such standard, specification, manual, code or instruction (whether or not specifically incorporated by reference in the Contract Documents); or

3.3.3.2 the provisions of any such Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

No provision of any such standard, specification, manual, code or instruction shall be effective to change the duties and responsibilities of OWNER, CONTRACTOR or ENGINEER, or any of their subcontractors, consultants, agents, or employees from those set forth in the Contract Documents, nor shall it be effective to assign to OWNER, ENGINEER or any of ENGINEER's Consultants, agents or employees any duty or authority to supervise or direct the furnishing or performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of paragraph 9.13 or any other provision of the Contract Documents.

3.4 Whenever in the Contract Documents the terms "as ordered," "as directed," "as required," "as allowed," "as approved," or terms of like effect or import are used, or the adjectives "reasonable," "suitable": "acceptable," "proper" or "satisfactory" or adjectives of like effect or import are used to describe a requirement, direction, review or judgment of ENGINEER as to the Work, it is intended that such requirement, direction, review or judgment will be solely to evaluate, in general, the completed Work for compliance with the requirements of and information in the Contract Documents and conformance with the design concept of the completed Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective shall not be effective to assign to ENGINEER any duty or authority to supervise or direct the furnishing or performance of the Work or any duty or authority to undertake responsibility contrary to the provisions of paragraph 9.13 or any other provision of the Contract Documents.

Amending and Supplementing Contract Documents:

3.5 The Contract Documents may be amended to provide for additions, deletions and revisions in the Work or to modify the terms and conditions thereof in one or more of the following ways:

3.5.1 a formal Written Amendment,
3.5.2 a Change Order (pursuant to paragraph 10.4), or
3.5.3 a Work Change Directive (pursuant to paragraph 10.1)

3.6 In addition, the requirements of the Contract Documents may be supplemented, and minor variations and deviations in the Work may be authorized, in one or more of the following ways:

3.6.1 a Field Order (pursuant to paragraph 9.5)
3.6.2 ENGINEER's approval of a Shop Drawing or Sample (pursuant to paragraphs 6.26 and 6.27), or
3.6.3 ENGINEER's written interpretation or clarification (pursuant to paragraph 9.4).

Reuse of Documents:

3.7 CONTRACTOR, and any Subcontractor or Supplier or other person or organization performing or furnishing any of the Work under a direct or indirect contract with OWNER (i) shall not 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 Engineer's Consultant, and (ii) shall not reuse any of such Drawings, Specifications, other documents or copies on extensions of the Project or any other project without written consent of OWNER and ENGINEER and specific written verification or adaption by ENGINEER.

ARTICLE 4 - AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; REFERENCE POINTS

Availability of Lands:

4.1 OWNER shall furnish, as indicated in the Contract Documents, the lands upon which the Work is to be performed, rights-of-way and easements for access thereto, and such other lands which are designated for the use of CONTRACTOR. OWNER shall identify any encumbrances or restrictions not of general application but specifically related to use of lands so furnished with which CONTRACTOR will have to comply in performing the Work. Easements for permanent structures or permanent changes in existing facilities will be obtained and paid for by OWNER, unless otherwise provided in the Contract Documents. If CONTRACTOR and OWNER are unable to agree on entitlement to or the amount or extent of any adjustments in the Contract Price or the Contract Times as a result of any delay in OWNER's furnishing these lands, rights-of-way or easements, CONTRACTOR may make a claim therefor as provided in Articles 11 and 12. CONTRACTOR shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

Subsurface and Physical Conditions:

4.2 BIDDER'S are responsible for examining and determining for themselves the location and nature of the proposed Work, the amount and character of the labor and materials required therefor, and the difficulties, which may be encountered. BIDDER's may not rely on oral or written representations made by the OWNER, including reports and drawings identified pursuant to 4.2.1 and subparagraphs thereof, unless the OWNER has guaranteed in writing that such representation is factually accurate, and by submitting a Bid, each BIDDER waives all liability for any error in any representation made by the OWNER to the BIDDER. BIDDER's shall inspect the site and its surroundings and conduct such supplementary examinations, investigations, and tests concerning conditions at or contiguous to the site (including surface, and subsurface) which may affect cost, progress, performance, or furnishing of the Work or which relate to any aspect of the means, methods, techniques, sequences, or procedures of construction to be employed by BIDDER and safety precautions and programs incident thereto for performing the Work in accordance with the Contract Documents. By failing to make such an inspection, the BIDDER waives all rights to claim extra payment or time extensions due to unexpected conditions, which could have been determined had the site been reasonably inspected. If concealed or unknown conditions differ materially from those ordinarily encountered and generally recognized as inherent in the Work, or differ materially from the conditions indicated in the Contract Documents, then an equitable adjustment in the Contract Price or in the Contract Time will be allowed by change order as provided in Article 11 or Article 12 respectively. By submitting a Bid, the BIDDER represents that the BIDDER's observations at the site are not

inconsistent with the requirements of the proposed Contract Documents, unless otherwise noted by the BIDDER.

4.2.1 **Reports and Drawings:** Reference is made to the Supplementary Conditions for identification of:

The following reports of explorations and tests of subsurface conditions at the site of the Work:

4.2.1.1 **Subsurface Conditions:** Those reports of explorations and tests of subsurface conditions at or contiguous to the site that have been utilized by ENGINEER in preparing the Contract Documents; and

Report dated **N/A** , **N/A**, prepared by **N/A** entitled: **N/A** . The technical data contained in such report upon which CONTRACTOR may rely is **N/A** .

Copies of these reports that are not included with Bidding Documents may be examined at ENGINEER's office during regular business hours. Please call for appointment. Copies of such reports are not available for distribution. These reports and drawings are not part of the Contract Documents, but the technical data contained therein upon which CONTRACTOR is entitled to rely as provided in GC-4.2 and as identified and established above are incorporated therein by reference.

4.2.1.2 **Physical Conditions:** Those drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the site (except Underground Facilities) that have been utilized by ENGINEER in preparing the Contract Documents.

4.2.2 **Limited Reliance by CONTRACTOR authorized; Technical Data:** Reports and drawings identified pursuant to paragraph 4.2 are not Contract Documents. Unless otherwise set forth in the Contract Documents or OWNER has otherwise guaranteed in writing that such representation is factually accurate, CONTRACTOR may not rely upon or make any claim against the OWNER, ENGINEER or ENGINEER's consultants with respect to the accuracy of any "technical data" contained in reports and drawings and CONTRACTOR may not rely upon or make any claim against the OWNER, ENGINEER or ENGINEER's consultants with respect to:

4.2.2.1 The completeness of such reports and drawings for CONTRACTOR's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by CONTRACTOR and safety precautions and programs incident thereto, or

4.2.2.2 other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings, or

4.2.2.3 any CONTRACTOR interpretation of or conclusion drawn from any "technical data" or any such data, interpretations, opinions or information.

4.2.3 CONTRACTOR shall not be entitled to any adjustment in the Contract Price or Times if:

4.2.3.1 CONTRACTOR knew of the existence of such conditions at the time CONTRACTOR made a final commitment to OWNER in respect of Contract Price and Contract Times by the submission of a bid or becoming bound under a negotiated contract; or

4.2.3.2 the existence of such condition could reasonably have been discovered or revealed as a result of any examination, investigation, exploration, test or study of the site and contiguous areas required by the Bidding Requirements or Contract Documents to be conducted by or for CONTRACTOR prior to CONTRACTOR's making such final commitment.

If OWNER and CONTRACTOR are unable to agree on entitlement to or as to the amount or length of any such equitable adjustment in the Contract Price or Contract Times, a claim may be made therefor as provided in Articles 11 and 12. However, OWNER, ENGINEER and ENGINEER's Consultants shall not be liable to CONTRACTOR for any claims, costs, losses or damages sustained by CONTRACTOR on or in connection with any other project or anticipated project.

4.3 Physical Conditions - Underground Facilities:

4.3.1 **Shown or Indicated:** The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or contiguous to the site is based on information and data furnished to OWNER or ENGINEER by the owners of such Underground Facilities or by others.

4.3.1.1 OWNER and ENGINEER shall not be responsible for the accuracy or completeness of any such information or data; and

4.3.1.2 The cost of all of the following will be included in the Contract Price and CONTRACTOR shall have full responsibility for: (i) reviewing and checking all such information and data, (ii) locating all Underground Facilities shown or indicated in the Contract Documents, (iii) coordination of the Work with the owners of such Underground Facilities during construction, and (iv) the safety and protection of all such Underground Facilities as provided in paragraph 6.20 and repairing any damage thereto resulting from the Work.

4.3.2 **Not Shown or Indicated:** If an Underground Facility is uncovered or revealed at or contiguous to the site which was not shown or indicated in the Contract Documents, CONTRACTOR shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by paragraph 6.23), identify the owner of such Underground Facility and give written notice to that owner and to OWNER and ENGINEER. CONTRACTOR shall be responsible for the safety and protection of such Underground Facility as provided in paragraph 6.20. CONTRACTOR shall be allowed an increase in the Contract Price or an extension of the Contract Times, or both, to the extent that they are attributable to the existence of any Underground Facility that was not shown or indicated in the Contract Documents and that CONTRACTOR did not know of and could not reasonably have been expected to be aware of or to have anticipated. If OWNER

and CONTRACTOR are unable to agree on entitlement to or the amount or length of any such adjustment in Contract Price or Contract Times, CONTRACTOR may make a claim therefor as provided in Articles 11 and 12. However, OWNER, ENGINEER and ENGINEER's Consultants shall not be liable to CONTRACTOR for any claims, costs, losses or damages incurred or sustained by CONTRACTOR on or in connection with any other project or anticipated project.

Reference Points:

4.4 OWNER shall provide engineering surveys to establish baseline and benchmarks for construction, which in ENGINEER's judgment are necessary to enable CONTRACTOR to proceed with the Work. CONTRACTOR shall be responsible for laying out the Work, shall protect and preserve the established reference points and shall make no changes or relocations without the prior written approval of OWNER, CONTRACTOR shall report to ENGINEER whenever any reference point is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points by professionally qualified personnel.

OWNER shall provide survey reference points, construction stakes, lines and grades required for the completion of the work specified in the specifications, on the plans, or in the Special Conditions. Additional staking requested by the Contractor will be at the CONTRACTOR'S expense. When the CONTRACTOR requires staking, he shall notify the OWNER of his requirements in writing a reasonable length of time in advance of starting work that require construction staking. Under no circumstances, shall a notice of less than 2 contract days be considered a reasonable length of time. Failure of the CONTRACTOR to provide 2 contract days written notice to the OWNER of his staking requests shall relieve the OWNER from any responsibility for additional costs or delays caused by such failure. Stakes set by the OWNER shall be carefully preserved by the CONTRACTOR. When stakes are destroyed or damaged, the CONTRACTOR will be charged for the cost of necessary replacement or restoration of stakes. The charge for replacement and restoration of stakes will be deducted from any moneys due or to become due the CONTRACTOR.

4.5 Asbestos, PCB's Petroleum, Hazardous Waste or Radioactive Material:

4.5.1 OWNER shall be responsible for any Asbestos, PCB's, Petroleum, Hazardous Waste or Radioactive Material uncovered or revealed at the site which was not shown or indicated in Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work and which may present a substantial danger to persons or property exposed thereto in connection with the Work at the site. OWNER shall not be responsible for any such materials brought to the site by CONTRACTOR, Subcontractor, Suppliers or anyone else for whom CONTRACTOR is responsible.

4.5.2 CONTRACTOR shall immediately: (i) stop all Work in connection with such hazardous condition and in any area affected thereby (except in an emergency as required by paragraph 6.23), and (ii) notify OWNER and ENGINEER (and thereafter confirm such notice in writing). OWNER shall promptly consult with ENGINEER concerning the necessity for OWNER to retain a qualified expert to evaluate such hazardous condition or take corrective action, if any. CONTRACTOR shall not be required to resume Work in connection with such hazardous condition or in any such affected area until after OWNER has obtained any required permits related thereto

and delivered to CONTRACTOR special written notice: (i) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work, or (ii) specifying any special conditions under which such Work may be resumed safely. If OWNER and CONTRACTOR cannot agree as to entitlement to or the amount or extent of an adjustment, if any, in Contract Price or Contract Times as a result of such Work stoppage or such special conditions under which Work is agreed by CONTRACTOR to be resumed, either party may make a claim therefor as provided Articles 11 and 12.

4.5.3 If after receipt of such special written notice CONTRACTOR does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then OWNER may order such portion of the Work that is in connection with such hazardous condition or in such affected area to be deleted from the Work. If OWNER and CONTRACTOR cannot agree as to entitlement to or the amount or extent of an adjustment, if any, in Contract Price or Contract Times as a result of deleting such portion of the Work, then either party may make a claim therefor as provided in Articles 11 and 12. OWNER may have such deleted portion of the Work performed by OWNER's own forces or others in accordance with Article 7.

4.5.4 The provisions of paragraphs 4.2 and 4.3 are not intended to apply to Asbestos, PCB's, Petroleum, Hazardous Waste or Radioactive Material uncovered or revealed at the site.

ARTICLE 5 - BONDS AND INSURANCE

Performance, Payment and Other Bonds:

5.1 CONTRACTOR shall furnish Performance and Payment Bonds, each in an amount at least equal to the Contract Price as security for the faithful performance and payment of all CONTRACT-OR's obligations under the Contract Documents. These Bonds shall remain in effect at least until one year after the date when final payment becomes due, except as provided otherwise by Laws or Regulations or by the Contract Documents. CONTRACTOR shall also furnish such other Bonds as are required by the Supplementary Conditions. All Bonds shall be in the form prescribed by the Contract Documents except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in the current list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (amended) by the Audit Staff, Bureau of Government Financial Operations, U.S. Treasury Department. All Bonds signed by an agent must be accompanied by a certified copy of such agent's authority to act. The CONTRACTOR shall furnish the performance and payment bond in the form provided in the Contract Documents or approved by the OWNER; the earlier of ten (10) days after the OWNER has issued the notice of award or delivery of the executed Agreement. The OWNER reserves the right to exclude any Surety Company on any ground it deems appropriate. The cost of the bonds shall be included in the bid.

5.2 If the surety on any Bond furnished by CONTRACTOR is declared a bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the Project is located or it ceases to meet the requirements of paragraph 5.1, CONTRACTOR shall within ten days thereafter substitute another Bond and surety, both of which must be acceptable to OWNER.

5.3 Licensed Sureties and Insurers; Certificates of Insurance:

5.3.1 All Bonds and insurance required by the Contract Documents to be purchased and maintained by CONTRACTOR shall be obtained from surety or insurance companies acceptable to OWNER that are duly licensed to transact business in the State of Colorado and to issue Bonds or insurance policies for the limits and coverage so required. Such surety and insurance companies shall also meet such additional requirements and qualifications as may be provided in the Supplementary Conditions.

5.3.2 CONTRACTOR shall deliver to OWNER, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by OWNER or any other additional insured) which CONTRACTOR is required to purchase and maintain accordance with paragraph 5.4. The certificates shall be reviewed and approved by OWNER prior to execution of the Agreement. The OWNER shall have the right to request and obtain copies of any insurance policies required under paragraph 5.4 of the General Conditions. The completed certificates of insurance shall be sent to: City of Louisville, 749 Main Street, Louisville, Colorado 80027, attention: CITY ENGINEER.

CONTRACTOR's Liability Insurance:

5.4 (a) The CONTRACTOR agrees to procure and maintain, at its own cost, a policy or policies of insurance sufficient to insure against all liability, claims, demands, and other obligations assumed by the CONTRACTOR pursuant to paragraphs 6.12, 6.16, 6.31, 6.32 and 6.33, and 6.5 in addition to any other insurance requirements imposed by the Contract Documents or by law. The CONTRACTOR shall not be relieved of any liability, claims, demands, or other obligations assumed pursuant to paragraphs 6.12, 6.16, 6.31, and 6.33 by reason of its failure to procure or maintain insurance, or by reason of its failure to procure or maintain insurance in sufficient amounts, durations, or types.

(b) CONTRACTOR shall procure and maintain, and shall cause any Subcontractor or Supplier of the CONTRACTOR to procure and maintain or insure the activity of his Subcontractors and Suppliers in his own policy, the minimum insurance coverages listed below. Such coverages shall be procured and maintained with forms and insurers acceptable to the OWNER. All coverages shall be continuously maintained from the date of commencement of the Work to cover all liability, claims, demands, and other obligations assumed by the CONTRACTOR pursuant to paragraphs 6.31 and 6.33. In the case of any claims-made policy, the necessary retroactive dates and extended reporting periods shall be procured to maintain such continuous coverage.

(1) Workers' Compensation insurance to cover obligations imposed by the Workers' Compensation Act of Colorado and any other applicable laws for any employee engaged in the performance of Work under this contract, and Employers' Liability insurance with minimum limits of FIVE HUNDRED THOUSAND DOLLARS ($500,000) each accident, FIVE HUNDRED THOUSAND DOLLARS ($500,000) disease - policy limit, and FIVE HUNDRED THOUSAND DOLLARS ($500,000) disease - each employee. Evidence of qualified self-insured status may be substituted for the Workers' Compensation requirements of this paragraph.

(2) Comprehensive General Liability insurance with minimum combined single limits of ONE MILLION DOLLARS ($1,000,000) each occurrence and TWO MILLION DOLLARS ($2,000,000) aggregate. The policy shall be applicable to all premises and operations. The policy shall include coverage for bodily injury, broad form property damage (including completed operations), personal injury (including coverage for contractual and employee acts), blanket contractual, independent contractors, products, and completed operations. The policy shall include coverage for explosion, collapse, and underground hazards. The policy shall contain a severability of interests' provision.

(3) Comprehensive Automobile Liability insurance with minimum combined single limits for bodily injury and property damage of not less than ONE MILLION DOLLARS ($1,000,000) each occurrence and ONE MILLION DOLLARS ($1,000,000) aggregate with respect to each of CONTRACTOR's owned, hired or non-owned vehicles assigned to or used in performance of the services. The policy shall contain a severability of interests' provision.

(4) The CONTRACTOR shall provide and maintain builder's risk insurance upon the entire project equal to one hundred percent (100%) of the insurable value thereof. Such insurance shall cover any and all physical damage including, without limitation, damage caused by fire, vandalism, malicious mischief, blasting, excessive surface runoff or storm water, high winds and other occurrences covered in a standard extended coverage endorsement. The policy shall remain in effect until the Work is accepted as substantially complete.

(c) The policy required by paragraph (2) above, by paragraph (3) and by (4) above shall be endorsed to include the OWNER, the ENGINEER and its consultants, and each of their officers, agents and employees as additional insureds. Every policy required above shall be primary insurance, and any insurance carried by the OWNER, its officers, or its employees, shall be excess and not contributory insurance to that provided by CONTRACTOR. No additional insured endorsement to the policy required by paragraph (1) above shall contain any exclusion for bodily injury or property damage arising from completed operations. The CONTRACTOR shall be solely responsible for any deductible losses under any policy required above.

(d) The certificate of insurance provided to OWNER shall be completed by the CONTRACTOR's insurance agent as evidence that policies providing the required coverages, conditions, and minimum limits are in full force and effect, and shall be reviewed and approved by the OWNER prior to commencement of the contract.

(e) Failure on the part of the CONTRACTOR to procure or maintain policies providing the required coverages, conditions, and minimum limits shall constitute a material breach of contract upon which the OWNER may immediately terminate this contract, or at its discretion may procure or renew any such policy or any extended reporting period thereto and may pay any and all premiums in connection therewith, and all monies so paid by the OWNER shall be repaid by CONTRACTOR to the OWNER upon demand, or the OWNER may offset the cost of the premiums against any monies due to CONTRACTOR from the Owner.

(f) The OWNER reserves the right to request and receive a certified copy of any policy and any endorsement thereto.

(g) The parties hereto understand and agree that the OWNER, the City of Louisville, is relying on, and does not waive or intend to waive by any provision of this contract, the monetary limitations (presently $150,000 per person and $600,000 per occurrence) or any other rights, immunities, and protections provided by the Colorado Governmental Immunity Act, § 24-10-101 et seq., 10 C.R.S., as from time to time amended, or otherwise available to the City of Louisville, its officers, or its employees.

OWNER's Liability Insurance:

5.5 In addition to the insurance required to be provided by CONTRACTOR under paragraph 5.4, OWNER, at OWNER's option, may purchase and maintain at OWNER's expense OWNER's own liability insurance as will protect OWNER against claims which may arise from operations under the Contract Documents.

Property Insurance:

5.6 The OWNER shall be responsible for maintaining its own property insurance and, at its option, may maintain such insurance as will protect it against claims which may arise from operations under the Contract Documents.

ARTICLE 6 - CONTRACTOR'S RESPONSIBILITIES

Supervision and Superintendence:

6.1 CONTRACTOR shall supervise, inspect and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. CONTRACTOR shall be solely responsible for the means, methods, techniques, sequences and procedures of construction, but CONTRACTOR shall not be responsible for the negligence of others in the design or specification of a specific means, method, technique, sequence or procedure of construction which is shown or indicated in and expressly required by the Contract Documents. CONTRACTOR shall be responsible to see that the completed Work complies accurately with the Contract Documents.

6.2 CONTRACTOR shall keep on the Work at all times during its progress a competent resident superintendent, who shall not be replaced without written notice to OWNER and ENGINEER except under extraordinary circumstances. The superintendent will be CONTRACTOR's representative at the site and shall have authority to act on behalf of CONTRACTOR. All communications to the superintendent shall be as binding as if given to CONTRACTOR.

Labor, Materials and Equipment:

6.3 CONTRACTOR shall provide competent, suitably qualified personnel to survey, layout and construct the Work as required by the Contract Documents. CONTRACTOR shall at all times maintain good discipline and order at the site. Except as otherwise required for the safety or protection of persons or the Work or property at the site or adjacent thereto, and except as otherwise indicated in the Contract Documents, all Work at the site shall be performed during regular working hours and CONTRACTOR will not permit overtime work or the performance of Work on Saturday, Sunday or any legal holiday without OWNER's written consent given after prior written notice to ENGINEER. No extra payment will be paid to the CONTRACTOR by the OWNER due to labor overtime or other increased costs of

performing the Work on Saturdays, Sundays, OWNER- observed holidays, or at night. Should the CONTRACTOR desire to work on Saturdays, Sundays, OWNER-observed holidays, or at night between the hours of 5:00 p.m. and 7:00 a.m. on **Contract Days** the CONTRACTOR shall submit a written request to the ENGINEER 24 hours prior. If approval is given by ENGINEER to CONTRACTOR for authorized overtime work, ENGINEER's and ENGINEER's authorized personnel will charge overtime and other incidental administrative expenses necessary for performing inspections on Saturdays, Sundays, OWNER-observed holidays, or at night between the hours of 5:00 p. m. and 7:00 a. m., the CONTRACTOR will be responsible to pay for all such rates and charges, and shall not be granted a Contract Price increase for such charges. Overtime and other incidental administrative expenses for Engineer and Engineer's authorized personnel are as follows:

DESCRIPTION	HOURLY RATE
Engineer	$100.00
Construction Inspector	$80.00
Operations Supervisor	$80.00
Maintenance Worker	$60.00
Clerical	$50.00
Vehicle	$25.00

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

6.5 All materials and equipment shall be of good quality and new, except as otherwise provided in the Contract Documents. All warranties and guarantees specifically called for by the Specifications shall expressly run to the benefit of OWNER. If required by ENGINEER, CONTRACTOR shall furnish satisfactory evidence (including reports of required tests) as to the kind and quality of materials and equipment. All materials and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned in accordance with instructions of the applicable Supplier, except as otherwise provided in the Contract Documents.

Progress Schedule:

6.6 CONTRACTOR shall adhere to the progress schedule established in accordance with paragraph 2.8 as it may be adjusted from time to time as provided below:

6.6.1 CONTRACTOR shall submit to ENGINEER for acceptance (to the extent indicated in paragraph 2.8) proposed adjustments in the progress schedule that will not change the Contract Times (or Milestones). Such adjustments will conform

generally to the progress schedule then in effect and additionally will comply with any provisions of the General Requirements applicable thereto.

6.6.2 Proposed adjustments in the progress schedule that will change the Contract Times (or Milestones) shall be submitted in accordance with the requirements of paragraph 12.1. Such adjustments may only be made by a Change Order or Written Amendment in accordance with Article 12.

6.7 Substitutes and "Or-Equal" Items:

6.7.1 Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the specification or description is intended to establish the type, function and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent or "or-equal" item or no substitution is permitted, other items of material or equipment of other Suppliers may be accepted by ENGINEER under the following circumstances:

6.7.1.1 **"Or-Equal"**: If in ENGINEER's sole discretion an item of material or equipment proposed by CONTRACTOR is functionally equal to that named and sufficiently similar so that no change in related Work will be required, it may be considered by ENGINEER as an "or-equal" item, in which case review and approval of the proposed item may, in ENGINEER's sole discretion, be accomplished without compliance with some or all of the requirements for acceptance of proposed substitute items.

6.7.1.2 **Substitute Items:** If in ENGINEER's sole discretion an item of material or equipment proposed by CONTRACTOR does not qualify as an "or-equal" item under subparagraph 6.7.1.1, it will be considered a proposed substitute item. CONTRACTOR shall submit sufficient information as provided below to allow ENGINEER to determine that the item of material or equipment proposed is essentially equivalent to that named and an acceptable substitute therefor. The procedure for review by the ENGINEER will include the following as supplemented in the General Requirements and as ENGINEER may decide is appropriate under the circumstances. Requests for review of proposed substitute items of material or equipment will not be accepted by ENGINEER from anyone other than CONTRACTOR. If CONTRACTOR wishes to furnish or use a substitute items of material or equipment, CONTRACTOR shall first make written application to ENGINEER for acceptance thereof, certifying that the proposed substitute will perform adequately the functions and achieve the results called for by the general design, be similar in substance to that specified and be suited to the same use as that specified. The application will state the extent, if any, to which the evaluation and acceptance of the proposed substitute will prejudice CONTRACTOR's achievement of Substantial Completion on time, whether or not acceptance of the substitute for use in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with OWNER for work on the Project) to adapt the design to the proposed substitute and whether or not incorporation or use of the substitute in connection

with the Work is subject to payment of any license fee or royalty. All variations of the proposed substitute from that specified will be identified in the application and available maintenance, repair and replacement service will be indicated. The application will also contain an itemized estimate of all costs or credits that will result directly or indirectly from acceptance of such substitute, including costs of redesign and claims of other contractors affected by the resulting change, all of which will be considered by ENGINEER in evaluating the proposed substitute. ENGINEER may require CONTRACTOR to furnish additional data about the proposed substitute.

6.7.1.3 **CONTRACTOR's Expense:** All data to be provided by CONTRACTOR in support of any proposed "or-equal" or substitute item will be at CONTRACTOR's expense.

6.7.2 **Substitute Construction Methods or Procedures:** If a specific means, method, technique, sequence or procedure of construction is shown or indicated in and expressly required by the Contract Documents, CONTRACTOR may furnish or utilize a substitute means, method, technique, sequence or procedure of construction acceptable to ENGINEER. CONTRACTOR shall submit sufficient information to allow ENGINEER, in ENGINEER's sole discretion, to determine that the substitute proposed is equivalent to that expressly called for by the Contract Documents. The procedure for review by ENGINEER will be similar to that provided in subparagraph 6.7.1.2.

6.7.3 **ENGINEER's Evaluation**: ENGINEER will be allowed a reasonable time within which to evaluate each proposal or submittal made pursuant to paragraphs 6.7.1.2 and 6.7.2. ENGINEER will be the sole judge of acceptability. No "or-equal" or substitute will be ordered, installed or utilized without ENGINEER's prior written acceptance, which will be evidenced by either a Change Order or an approved Shop Drawing. OWNER may require CONTRACTOR to furnish at CONTRACTOR's expense a special performance guarantee or other surety with respect to any "or-equal" or substitute. ENGINEER will record time required by ENGINEER and ENGINEER's Consultants in evaluating substitutes proposed or submitted by CONTRACTOR pursuant to paragraphs 6.7.1.2 and 6.7.2 and in making changes in the Contract Documents (or in the provisions of any other direct contract with OWNER for work on the Project) occasioned thereby. Whether or not ENGINEER accepts a substitute item so proposed or submitted by CONTRACTOR, CONTRACTOR shall reimburse OWNER for the charges of ENGINEER and ENGINEER's Consultants for evaluating each such proposed substitute item.

6.8 Concerning Subcontractors, Suppliers and Others:

6.8.1 CONTRACTOR shall not employ any Subcontractor, Supplier or other person or organization, whether initially or as a substitute, against whom OWNER or ENGINEER may have reasonable objection. CONTRACTOR shall not be required to employ any Subcontractor, Supplier or other person or organization to furnish or perform any of the Work against whom CONTRACTOR has reasonable objection.

6.8.2 The Contract Documents require the identity of certain Subcontractors, Suppliers or other persons or organizations (including those who are to furnish the principal items of materials or equipment) to be submitted to OWNER with the Bid in the Bid Form

prior to the Effective Date of the Agreement for acceptance by OWNER and ENGINEER, and if CONTRACTOR has submitted a list thereof in accordance with the Contract Documents, OWNER'S or ENGINEER's acceptance (either in writing or by failing to make written objection thereto by the date indicated for acceptance or objection in Contract Documents) of any such Subcontractor, Supplier, or other person or organization so identified may be revoked on the basis of reasonable objection after due investigation, in which case CONTRACTOR shall submit an acceptable substitute. No acceptance by OWNER or ENGINEER of any such Subcontractor, Supplier or other person or organization shall constitute a waiver of any right of OWNER or ENGINEER to reject defective Work.

6.8.3 Subletting of Contract. The Contractor shall not sublet, sell, transfer, assign, or dispose of the Contract or Contracts, or any portion thereof without written consent of the Engineer. The Contractor will be permitted to sublet a portion of the Contract, however, the Contractor's organization shall perform work amounting to not less than 50 percent of the total contract cost.

The calculation of the percentage of subcontracted work shall be based on the prime contract unit prices rather than subcontract unit prices. Proportional value for a subcontracted partial contract item shall be verified by the Engineer. For the purpose of calculating the value of subcontracted work, the cost of procuring materials and manufactured products can be included in either the prime contract or subcontract. However, when a firm both sells material to a prime contractor and performs the work of incorporating the materials into the project, these two phases shall be considered in combination and as constituting a single subcontract.

Subcontracts, or transfer of Contract shall not release the Contractor of liability under the Contract and bonds.

6.9.1 CONTRACTOR shall be fully responsible to OWNER and ENGINEER for all acts and omissions of the Subcontractors. Suppliers and other persons and organizations performing or furnishing any of the Work under a direct or indirect contract with CONTRACTOR just as CONTRACTOR is responsible for CONTRACTOR's own acts and omissions. OWNER or ENGINEER may furnish to any such Subcontractor, Supplier or other person or organization, to the extent practicable, evidence of amounts paid to CONTRACTOR in accordance with CONTRACTOR's Applications for Payment. Nothing in the Contract Documents shall create for the benefit of any such Subcontractor, Supplier or other person or organization any contractual relationship between OWNER or ENGINEER and any such Subcontractor, Supplier or other person or organization, nor shall it create any obligation on the part of OWNER or ENGINEER to pay or to see to the payment of any moneys due any such Subcontractor, Supplier or other person or organization except as may otherwise be required by Laws and Regulations.

6.9.2 CONTRACTOR shall be solely responsible for scheduling and coordinating the Work of Subcontractors, Suppliers and other persons and organizations performing or furnishing any of the Work under a direct or indirect contract with CONTRACTOR. CONTRACTOR shall require all Subcontractors, Suppliers and such other persons and organizations performing or furnishing any of the Work to communicate with the ENGINEER through CONTRACTOR.

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

6.11 All Work performed for CONTRACTOR by a Subcontractor or Supplier will be pursuant to an appropriate agreement between CONTRACTOR and the Subcontractor or Supplier, which specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of OWNER and ENGINEER.

Patent Fees and Royalties:

6.12 CONTRACTOR shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product or device is specified in the Contract Documents for use in the performance of the Work and if to the actual knowledge of OWNER or ENGINEER its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by OWNER in the Contract Documents. To the fullest extent permitted by Laws and Regulations, CONTRACTOR shall indemnify and hold harmless OWNER, ENGINEER, ENGINEER's Consultants and the officers, directors, employees, agents and other consultants of each and any of them from and against all claims, costs, losses and damages arising out of or resulting from any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product or device not specified in the Contract Documents.

Permits:

6.13 Unless otherwise provided in the Supplementary Conditions, CONTRACTOR shall obtain and pay for all construction permits and licenses. OWNER shall assist CONTRACTOR, when necessary, in obtaining such permits and licenses. CONTRACTOR shall pay all governmental charges and inspection fees necessary for the prosecution of the Work, which are applicable at the time of opening of Bids, or, if there are no Bids, on the Effective Date of the Agreement. CONTRACTOR shall pay all charges of utility owners for connections to the Work, and OWNER shall pay all charges of such utility owners for capital costs related thereto such as plant investment fees.

6.13.1 Prior to the commencement date for the Work set forth in the Notice to Proceed, The CONTRACTOR and all subcontractors shall be or shall become a CONTRACTOR licensed in accordance with the applicable ordinance of the City of Louisville, Colorado.

6.13.2 If water is required for the project, CONTRACTOR shall obtain a bulk water permit from the City of Louisville, Public Works Department in accordance with the permit requirements.

6.13.3 CONTRACTOR shall obtain a Right-of-Way Permit from the City of Louisville, Public Works Department for all Work to be completed within the City right-of-way.

6.13.4 CONTRACTOR shall obtain and pay for all other necessary construction permits and licenses.

Laws and Regulations:

6.14.1 CONTRACTOR shall give all notices and comply with all Laws and Regulations applicable to furnishing and performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither OWNER nor ENGINEER shall be responsible for monitoring CONTRACTOR's compliance with any Laws or Regulations.

6.14.2 If CONTRACTOR performs any Work knowing or having reason to know that it is contrary to Laws or Regulations, CONTRACTOR shall bear all claims, costs, losses and damages caused by, arising out of or resulting therefrom: however, it shall not be CONTRACTOR's primary responsibility to make certain that the Specifications and Drawings are in accordance with Laws and Regulations, but this shall not relieve CONTRACTOR of CONTRACTOR's obligations under paragraph 3.3.2.

Taxes:

6.15 CONTRACTOR shall pay all sales, consumer, use and other similar taxes required to be paid by CONTRACTOR in accordance with the Laws and Regulations of the place of the Project, which are applicable during the performance of the Work. City of Louisville municipal taxes shall be waived upon application for and acceptance of "tax exemption."

The CONTRACTOR shall apply for and receive a Certificate of Exemption from the Colorado Department of Revenue for construction materials to be physically incorporated into the Work. This Certificate of Exemption provides that the CONTRACTOR shall neither pay nor include in his bid prices Sales and Use Taxes collected by the State of Colorado on those building and construction materials physically incorporated into the Work. Sales and Use Taxes of the State of Colorado, RTD and the County are collected by the State of Colorado. All applicable Sales and Use Taxes (including State collected taxes) on any items other than construction and building materials physically incorporated into the Work are to be paid by the Contractor and are to be included in the appropriate bid items. CONTRACTOR and any Subcontractor assume all liability for the nonpayment of taxes, or the payment of exempt taxes resulting from a failure to use the Certificate of Exemption required by this paragraph.

Use of Premises:

6.16 CONTRACTOR shall confine construction equipment, the storage of materials and equipment and the operations of workers to the site and land and areas identified in and permitted by the Contract Documents and other land and areas permitted by Laws and Regulations, rights-of-way, permits and easements, and shall not unreasonably encumber the premises with construction equipment or other materials or equipment. CONTRACTOR shall assume full responsibility for any damage to any such land or area, or to the owner or occupant thereof or of any adjacent land or areas, resulting from the performance of the Work. Should any claim be made by any such owner or occupant because of the performance of the Work, CONTRACTOR shall promptly settle with such other party by negotiation or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law. CONTRACTOR shall, to the fullest extent permitted by Laws and Regulations, indemnify and hold harmless OWNER, ENGINEER, ENGINEER's Consultant and anyone directly or indirectly employed by any of them from and against all claims, costs, losses and damages arising out of or resulting from any claim or action, legal or equitable, brought by any such owner or occupant against OWNER, ENGINEER, or any other party

indemnified hereunder to the extent caused by or based upon CONTRACTOR's performance of the Work.

6.17 During the progress of the Work, CONTRACTOR shall keep the premises free from accumulations of waste materials, rubbish and other debris resulting from the Work. At the completion of the Work, CONTRACTOR shall remove all waste materials, rubbish and debris from and about the premises as well as all tools, appliances, construction equipment and machinery and surplus materials. CONTRACTOR shall leave the site clean and ready for occupancy by OWNER at Substantial Completion of the Work. CONTRACTOR shall restore to original condition all property not designated for alteration by the Contract Documents.

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

Record Documents:

6.19 CONTRACTOR shall maintain in a safe place at the site one record copy of all Drawings, Specifications, Addenda, Written Amendments, Change Orders, Work Change Directives, Field Orders and written interpretations and clarifications (issued pursuant to paragraph 9.4) in good order and annotated to show all changes made during construction. These record documents together with all approved Samples and a counterpart of all approved Shop Drawings will be available to ENGINEER for reference. Upon completion of the Work, these record documents, Samples and Shop Drawings will be delivered to ENGINEER for OWNER.

Safety and Protection:

6.20 CONTRACTOR shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. CONTRACTOR shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:

6.20.1 all persons on the Work site or who may be affected by the Work:

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

6.20.3 other property at the site or adjacent thereto, including but not limited to trees, shrubs, lawns, walks, pavements, roadways, structures, fences, gates, ditches, utilities, and underground facilities not designated for removal, relocation, or replacement in and during the course of construction.

6.20.4 The CONTRACTOR shall take all measures necessary to mitigate the impact of weather so that the project may continue on schedule. In no event shall OWNER be liable for extra costs incurred on materials and any part of the Work due to CONTRACTOR's failing to take all measures necessary protect the Work from weather and CONTRACTOR shall not be entitled to such claims. Also, no extension of the Contract Time shall be allowed if the CONTRACTOR is able, notwithstanding the weather, to proceed with other Work of the Contract.

CONTRACTOR shall comply with all applicable Laws and Regulations of any public body having jurisdiction for safety of persons or property or to protect them from damage, injury or loss; and shall erect and maintain all necessary safeguards for such safety and protection. CONTRACTOR shall notify owners of adjacent property and of Underground Facilities and utility owners when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation and replacement of their property. All damage, injury or loss to any property referred to in paragraph 6.20.2 or 6.20.3 caused, directly or indirectly, in whole or in part, by CONTRACTOR, any Subcontractor, Supplier or any other person or organization directly or employed by any of them to perform or furnish any of the Work or anyone for whose acts any of them may be liable, shall be remedied by CONTRACTOR. CONTRACTOR's duties and responsibilities for safety and for protection of the work shall continue until such time as all the Work is completed and ENGINEER has issued a notice to OWNER and CONTRACTOR in accordance with paragraph 14.13 that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).

Safety Representative:

6.21 CONTRACTOR shall designate a qualified and experienced safety representative at the site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs.

Hazard Communication Programs:

6.22 CONTRACTOR shall be responsible for coordinating any exchange of material safety data sheets or other hazard communication information required to be made available to or exchanged between or among employers at the site in accordance with Laws or Regulations.

Emergencies:

6.23 In emergencies affecting the safety or protection of persons or the Work or property at the site or adjacent thereto, CONTRACTOR, without special instruction or authorization from OWNER or ENGINEER, is obligated to act to prevent threatened damage, injury or loss. CONTRACTOR shall give ENGINEER prompt written notice if CONTRACTOR believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby. If ENGINEER determines that a change in the Contract Documents is required because of the action taken by CONTRACTOR in response to such an emergency, a Work Change directive or Change order will be issued to document the consequences of such action.

6.24 Shop Drawings and Samples:

6.24.1 After checking and verifying all field measurements, CONTRACTOR shall submit to ENGINEER for review and approval in accordance with the accepted schedule of shop drawings and sample submittal (see paragraph 2.8), three copies (or at ENGINEERS option, one reproducible copy) of all shop drawings, which shall have been checked and approved by the CONTRACTOR. The data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials and similar data to show ENGINEER the materials and equipment CONTRACTOR proposes to provide and to enable ENGINEER to review the information for the limited purposes required by paragraph 6.26.

6.24.2 CONTRACTOR shall also submit Samples to ENGINEER for review and approval in accordance with said accepted schedule of Shop Drawings and Sample submittals. Each Sample will be identified clearly as to material, Supplier, pertinent data such as catalog numbers and the use for which intended and otherwise as ENGINEER may require to enable ENGINEER to review the submittal for the limited purposes required by paragraph 6.26. The numbers of each Sample to be submitted will be as specified in the Specifications.

6.26 Submittal Procedures:

6.25.1 Before submitting each Shop Drawing or Sample, CONTRACTOR shall have determined and verified:

6.25.1.1 all field measurements, quantities, dimensions, specified performance criteria, installation requirements, materials, catalog numbers and similar information with respect thereto,

6.25.1.2 all materials with respect to intended use, fabrication, shipping, handling, storage, assembly and installation pertaining to the performance of the Work, and

6.25.1.3 all information relative to CONTRACTOR's sole responsibilities in respect of means, methods, techniques, sequences and procedures of construction and safety precautions and programs incident thereto.

CONTRACTOR shall also have reviewed and coordinated each Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents.

6.25.2 Each submittal will bear a stamp or specific written indication that CONTRACTOR has satisfied CONTRACTOR's obligations under the Contract Documents with respect to CONTRACTOR's review and approval of that submittal.

6.25.3 At the time of each submission, CONTRACTOR shall give ENGINEER specific written notice of such variations, if any, that the Shop Drawing or Sample submitted may have from the requirements of the Contract Documents, such notice to be in a written communication separate from the submittal; and, in addition, shall cause a specific notation to be made on each Shop Drawing and Sample submitted to ENGINEER for review and approval of each such variation.

6.26 ENGINEER will review and approve Shop Drawings and Samples in accordance with the schedule of Shop Drawings and Sample submittals accepted by ENGINEER as required by paragraph 2.8. ENGINEER's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. ENGINEER's review and approval will not extend to means, methods, techniques, sequences or procedures of construction (except where a particular means, method, technique, sequence or procedure of construction is specifically and expressly called for by the Contract documents) or to safety precautions or programs incident thereto. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions. CONTRACTOR shall make corrections required by ENGINEER, and

shall return the required number of corrected copies of Shop Drawings and submit as required new Samples for review and approval. CONTRACTOR shall direct specific attention in writing to revisions other than the corrections called for by ENGINEER on previous submittals.

6.27 ENGINEER's review and approval of Shop Drawings or Samples shall not relieve CONTRACTOR from responsibility for any variation from the requirements of the Contract Documents unless CONTRACTOR has in writing called ENGINEER's attention to each such variation at the time of submission as required by paragraph 6.25.3 and ENGINEER has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample approval; nor will any approval by ENGINEER relieve CONTRACTOR from responsibility for complying with the requirements of paragraph 6.25.1.

6.28 Where a Shop Drawing or Sample is required by the Contract Documents or the schedule of Shop Drawings and Sample submissions accepted by ENGINEER as required by paragraph 2.8, any related Work performed prior to ENGINEER's review and approval of the pertinent submittal will be at the sole expense and responsibility of CONTRACTOR.

Continuing the Work:

6.29 CONTRACTOR shall carry on the Work and adhere to the progress schedule during all disputes or disagreements with OWNER. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, except as permitted by paragraph 15.5 or as OWNER and CONTRACTOR may otherwise agree in writing.

6.30 CONTRACTOR's General Warranty and Guarantee:

6.30.1 CONTRACTOR warrants and guarantees to OWNER, ENGINEER and ENGINEER's Consultants that all Work will be in accordance with the Contract Documents and will not be **defective**. CONTRACTOR's warranty and guarantee hereunder excludes defects or damage caused by:

6.30.1.1 abuse, modification or improper maintenance or operation by persons other than CONTRACTOR, Subcontractors or Suppliers; or

6.30.1.2 normal wear and tear under normal usage.

6.30.2 CONTRACTOR's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of CONTRACTOR's obligation to perform the work in accordance with the Contract Documents:

6.30.2.1 observations by ENGINEER;

6.30.2.2 recommendation of any progress or final payment by ENGINEER;

6.30.2.3 the issuance of a certificate of Substantial Completion or any payment by OWNER to CONTRACTOR under the Contract Documents;

6.30.2.4 use or occupancy of the Work or any part thereof by OWNER;

6.30.2.5 any acceptance by OWNER or any failure to do so;

6.30.2.6 any review and approval of a Shop Drawing or Sample submittal or the issuance of a notice of acceptability by ENGINEER pursuant to paragraph 14.13;

6.30.2.7 any inspection, test or approval by others; or

6.30.2.8 any correction of **defective** Work by OWNER.

6.30.3 The CONTRACTOR warrants that, unless otherwise specified in the Contract Documents, the materials and equipment installed in the Work will be new, merchantable, and fit for the purpose for which they are intended, and that the Work will be performed in a workmanlike manner. The CONTRACTOR also warrants the workers who perform the Work will be sufficiently skilled to produce a high quality product which is free of blemishes, (surface defects) and flaws (internal defects).

The CONTRACTOR is under a continuing duty to warn the OWNER and ENGINEER of any possible defect in the design of the Work and materials incorporated in the Work and against potentially unsafe uses of products incorporated in the Work which may cause personal injury or property damage, as soon as the CONTRACTOR discovers the possible defect or has notice that the product may be unsafe. The CONTRACTOR's duty under this paragraph shall be continuing, and shall not expire when the OWNER accepts the Work or when the CONTRACTOR's guarantee expires. If the CONTRACTOR fails to warn the Owner of a design or product defect of which the CONTRACTOR is aware, and if personal or property damage thereafter results from such design or product defect, the CONTRACTOR shall be liable jointly and severally with any other party responsible at law for all damages resulting from such defect.

6.31 Indemnification:

The CONTRACTOR agrees to indemnify and hold harmless the OWNER (City of Louisville), ENGINEER, ENGINEER's consultants, and their officers, employees, agents and insurers, from and against all liability, claims, and demands, on account of injury, loss, or damage, including without limitation claims arising from bodily injury, personal injury, sickness, disease, death, property loss or damage, or any other loss of any kind whatsoever, which arise out of or are in any manner connected with this contract, if such injury, loss, or damage is caused in whole or in part by, or is claimed to be caused in whole or in part by, the act, omission, error, professional error, mistake, negligence, or other fault of the CONTRACTOR, any Subcontractor of the CONTRACTOR, or any officer, employee, representative, or agent of the CONTRACTOR or of any Subcontractor of the CONTRACTOR, or which arise out of any workers' compensation claim of any employee of the CONTRACTOR or of any employee of any subcontractor of the CONTRACTOR. The CONTRACTOR agrees to investigate, handle, respond to, and to provide defense for and defend against, any such liability, claims or demands at the sole expense of the CONTRACTOR. The CONTRACTOR also agrees to bear all other costs and expenses related thereto, including court costs and attorney fees, whether or not any such liability, claims, or demands alleged are groundless, false, or fraudulent.

6.32 In any and all claims against OWNER or ENGINEER or any of their respective consultants, agents, officers, directors or employees by any employee (or the survivor or personal representative of such employee) of CONTRACTOR, any Subcontractor, any Supplier, any person or organization directly or indirectly employed by any of them to perform or furnish any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under paragraph 6.31 shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for CONTRACTOR or any such Subcontractor, Supplier or other person or organization under workers' compensation acts, disability benefit acts or other employee benefit acts.

Survival of Obligations:

6.33 All representations, indemnifications, warranties and guarantees made in, required by or given in accordance with the Contract Documents, as well as all continuing obligations indicated in the Contract Documents, will survive final payment, completion and acceptance of the work and termination or completion of the Agreement.

ARTICLE 7 - OTHER WORK

Related Work at Site:

7.1 OWNER may perform other work related to the Project at the site by OWNER's own forces, or let other direct contracts therefor which shall contain General Conditions similar to these, or have other work performed by utility owners. If the fact that such other work is to be performed was not noted in the Contract Documents, then: (i) written notice thereof will be given to CONTRACTOR prior to starting any such other work, and (ii) CONTRACTOR may make a claim therefor as provided in Articles 11 and 12 if CONTRACTOR believes that such performance will involve additional expense to CONTRACTOR or requires additional time and the parties are unable to agree as to the amount or extent thereof.

7.2 CONTRACTOR shall afford each other contractor who is a party to such a direct contract and each utility owner (and OWNER, if OWNER is performing the additional work with OWNER's employees) proper and safe access to the site and a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work and shall properly connect and coordinate the Work with theirs. Unless otherwise provided in the Contract Documents, CONTRACTOR shall do all cutting, fitting and patching of the Work that may be required to make its several parts come together properly and integrate with such other work. CONTRACTOR shall not endanger any work of others by cutting, excavating or otherwise altering their work and will only cut or alter their work with the written consent of ENGINEER and the others whose work will be affected. The duties and responsibilities of CONTRACTOR under this paragraph are for the benefit of such utility owners and other contractors to the extent that there are comparable provisions for the benefit of CONTRACTOR in said direct contracts between OWNER and such utility owners and other contractors.

7.3 If the proper execution or results of any part of CONTRACTOR's work depends upon work performed by others under this Article 7, CONTRACTOR shall inspect such other work and promptly report to ENGINEER in writing any delays, defects or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of CONTRACTOR's Work. CONTRACTOR's failure so to report will constitute an acceptance of such other work as fit and proper for integration with CONTRACTOR's Work except for latent or non-apparent defects and deficiencies in such other work.

Coordination:

7.4 Unless otherwise provided in the Supplementary Conditions, OWNER shall have sole authority and responsibility in respect of such coordination.

Should CONTRACTOR cause damage to the Work or property of any separate CONTRACTOR at the site, or should any claim arising out of CONTRACTOR's performance of the Work at the site be made by any separate contractor against CONTRACTOR, OWNER, ENGINEER, or any other person, CONTRACTOR shall promptly attempt to settle with such other contractor by agreement, or to otherwise resolve the dispute by arbitration or at law. CONTRACTOR shall, to the fullest extent permitted by Laws, and Regulations, indemnify and hold OWNER and ENGINEER harmless from and against all claims, damages, losses and expenses (including, but not limited to, fees of engineers, architects, attorneys and other professionals and court and arbitration costs) arising directly, indirectly or consequentially out of any action, legal or equitable, brought by any separate contractor against OWNER or ENGINEER to the extent based on a claim arising out of CONTRACTOR's performance of the Work. Should a separate contractor cause damage to the Work or property of CONTRACTOR or should the performance of Work by any separate CONTRACTOR at the site give rise to any other claim, CONTRACTOR shall not institute any action, legal or equitable, against OWNER or ENGINEER or permit any action against any of them to be maintained and continued in its name or for its benefit in any court or before any arbiter which seeks to impose liability on or to recover damages from OWNER or ENGINEER on account of any such damage or claim. If CONTRACTOR is delayed at any time in performing or furnishing Work by any act or neglect of a separate contractor and OWNER and CONTRACTOR are unable to agree as to the extent of any adjustment in Contract Time attributable thereto, CONTRACTOR may make a claim for an extension of time in accordance with Article 12. An extension of the Contract Time shall be CONTRACTOR's exclusive remedy with respect to OWNER and ENGINEER for any delay, disruption, interference or hindrance cause by any separate contractor. This paragraph does not prevent recovery from OWNER or ENGINEER for activities that are their respective responsibilities.

ARTICLE 8 - OWNER'S RESPONSIBILITIES

8.1 Except as otherwise provided in these General Conditions, OWNER shall issue all communications to CONTRACTOR through ENGINEER.

8.2 In case of termination of the employment of ENGINEER, OWNER shall appoint an engineer whose status under the Contract Documents shall be that of the former ENGINEER.

8.3 OWNER shall furnish the data required of OWNER under the Contract documents promptly and shall make payments to CONTRACTOR promptly when they are due as provided in paragraphs 14.4 and 14.13.

8.4 OWNER's duties in respect of providing lands and easements and providing engineering surveys to establish reference points are set forth in paragraphs 4.1 and 4.4.

8.5 OWNER is obligated to execute Change Orders as indicated in paragraph 10.4.

8.6 OWNER's responsibility in respect of certain inspections, tests and approvals is set forth in paragraph 13.4.

8.7 In connection with OWNER's right to stop Work or suspend Work, see paragraphs 13.10 and 15.1. Paragraph 15.2 deals with OWNER's right to terminate services of CONTRACTOR under certain circumstances.

8.8 The OWNER shall not supervise, direct or have control or authority over, nor be responsible for, CONTRACTOR's means, methods, techniques, sequences or procedures of construction or the safety precautions and programs incident thereto, or for any failure of CONTRACTOR to comply with Laws and Regulations applicable to the furnishing or performance of the Work. OWNER will not be responsible for CONTRACTOR's failure to perform or furnish the Work in accordance with the Contract Documents.

8.9 OWNER's responsibility in respect of undisclosed Asbestos, PCBs, Petroleum, Hazardous Waste or Radioactive Materials uncovered or revealed at the site is set forth in paragraph 4.5.

8.10 If and to the extent OWNER has agreed to furnish CONTRACTOR reasonable evidence that financial arrangements have been made to satisfy OWNER's obligations under the Contract Documents, OWNER's responsibility in respect thereof will be as set forth in the Supplementary Conditions.

ARTICLE 9 - ENGINEER'S STATUS DURING CONSTRUCTION

OWNER's Representative:

9.1 ENGINEER will be OWNER's representative during the construction period. The duties and responsibilities and the limitations of authority of ENGINEER as OWNER's representative during construction are set forth in the Contract Documents and shall not be extended without written consent of OWNER and ENGINEER.

Visits to Site:

9.2 ENGINEER will make visits to the site at intervals appropriate to the various stages of construction as ENGINEER deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of CONTRACTOR's executed Work. Based on information obtained during such visits and observations, ENGINEER will endeavor for the benefit of OWNER to determine, in general, if the Work is proceeding in accordance with the Contract Documents. ENGINEER will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. ENGINEER's efforts will be directed toward providing for OWNER a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and on-site observations, ENGINEER will keep OWNER informed of the progress of the Work and will endeavor to guard OWNER against **defective** Work. ENGINEER's visits and on-site observations are subject to all the limitations on ENGINEER's authority and responsibility set forth in paragraph 9.13 and particularly, but without limitation, during or as a result of ENGINEER's on-site visits or observations of CONTRACTOR's Work ENGINEER will not supervise, direct, control or have authority over or be responsible for CONTRACTOR's means, methods, techniques, sequences or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of CONTRACTOR to comply with Laws and Regulations applicable to the furnishing or performance of the Work.

Project Representative:

9.3 ENGINEER will furnish a Resident Project Representative, assistants and other field staff to assist ENGINEER in observing the performance of the Work of the CONTRACTOR. The responsibilities and authority and limitations thereon of any such Resident Project Representative and assistants will be as provided in paragraph 9.13 and in the Supplementary Conditions. If OWNER designates another representative or agent to represent OWNER at the site who is not ENGINEER's Consultant, agent or employee, the responsibilities and authority and limitations thereon of such other person will be as provided in the Supplementary Conditions.

9.3.1 Resident Project Representative is ENGINEER's Agent and will act as directed by and under the supervision of ENGINEER, and will confer with ENGINEER regarding his actions. His dealings in matters pertaining to the on-site Work will in general be with ENGINEER and CONTRACTOR keeping the ENGINEER advised as necessary. His dealings with Subcontractors will only be through or with the full knowledge and approval of CONTRACTOR.

Duties and Responsibilities:

Resident Project Representative will:

Schedules:

Review the progress schedule, schedule of Shop Drawing submittal, schedule of values and other schedules prepared by CONTRACTOR and consult with ENGINEER concerning acceptability.

Conferences and Meetings:

Attend meetings with CONTRACTOR, such as preconstruction conferences, progress meetings and other job conferences and other project related meetings.

Liaison:

Serve as ENGINEER's liaison with CONTRACTOR, working principally through CONTRACTOR's superintendent and assist him in understanding the intent of the Contract Documents. Assist ENGINEER in serving as OWNER's liaison with CONTRACTOR when CONTRACTOR's operations affect OWNER's on-site operations.

Assist in obtaining from ENGINEER additional details or information, when required for proper execution of the Work.

Shop Drawings and Samples:

Record date of receipt of Shop Drawings and samples.
Receive samples, which are furnished at the site by CONTRACTOR for ENGINEER's review, and notify ENGINEER of their availability for examination.

Advise ENGINEER and CONTRACTOR of the commencement of any Work requiring a Shop Drawing or sample submission if the submission has not been approved by ENGINEER.

Review of Work, Rejection of Defective Work, Inspections and Tests:

Conduct on-site observations of the Work in progress to assist ENGINEER in determining that the Work is proceeding in accordance with the Contract Documents.

Report to ENGINEER whenever he believes that any Work is unsatisfactory, faulty or defective or does not conform to the Contract Documents, or has been damaged, or does not meet the requirements of any inspections, tests or approvals required to be made; and advise ENGINEER when he believes Work should be corrected or rejected or should be uncovered for observation, or requires special testing, inspection or approval.

Verify that tests, equipment and systems startups and operating and maintenance training are conducted in presence of the appropriate personnel, and that CONTRACTOR maintains adequate records thereof; observe, record and report to ENGINEER appropriate details relative to the test procedures and start-ups.

Accompany visiting inspectors representing public or other agencies having jurisdiction over the Project, record the results of these inspections and report to ENGINEER.

Interpretation of Contract Documents:

Report to ENGINEER when clarifications and interpretations of the Contract Documents are needed and Transmit to CONTRACTOR clarification and interpretation of the Contract Documents as issued by ENGINEER.

Modifications:

Consider and evaluate CONTRACTOR's suggestions for modification in Drawings or Specifications and report with his recommendations to ENGINEER. Transmit to CONTRACTOR decisions issued by ENGINEER.

Records:

Maintain at the job site orderly files for correspondence, reports of job conferences, Shop Drawings and samples, reproductions or original Contract Documents including all Work Directive Changes, Addenda, Change Orders, Field Orders, additional Drawings issued subsequent to the execution of the Agreement, ENGINEER's clarifications and interpretations of the Contract Documents, progress reports and other Project related documents.

Keep a diary, daily report form, or log book, recording hours on the job site, weather conditions, data relative to questions of Work Directive Changes, Change Orders, or changed conditions, list of job site visitors, daily activities, decisions, observations in general and specific observations in more detail as in the case of observing test procedures.

Record names, addresses and telephone numbers of all CONTRACTOR's, subcontractors and major suppliers of equipment and materials.

Reports:

Furnish ENGINEER periodic reports as required of progress of the Work and of CONTRACTOR's compliance with the progress schedule and schedule of Shop Drawings and sample submittal.

Consult with ENGINEER in advance of scheduled major tests, inspections or start of important phases of the Work.

Draft proposed Change Orders and Work Directive Changes, obtaining backup material from CONTRACTOR and recommend to ENGINEER Change Orders, Work Directive Changes, and Field Orders.

Report immediately to ENGINEER upon the occurrence of any accident.

Payment Requests:

Review applications for payment with CONTRACTOR for compliance with the established procedure for their submission and forward with his recommendations to ENGINEER, noting particularly the relationship of the payment requested to the schedule of values, Work completed and materials and equipment delivered at the site but not incorporated in the Work.

Certificates, Maintenance and Operations Manuals:

During the Course of Work verify that certifications, maintenance and operation manuals and other data required to be assembled and furnished by CONTRACTOR are applicable to the items actually installed and in accordance with the Contract Documents, and have this material delivered to ENGINEER for review and forwarding to OWNER prior to final payment of the Work.

Completion:

Before ENGINEER issues a Certificate of Substantial Completion, submit to CONTRACTOR a list of observed items requiring correction or completion.

Conduct final inspection in the company of ENGINEER and CONTRACTOR and prepare a final list of items to be corrected or completed.

Observe that all items on final list have been corrected or completed and make recommendations to ENGINEER concerning acceptance.

Limitation of Authority:

Resident Project Representative shall not:

Authorize any deviations from the Contract Documents or accept any substitute materials or equipment, unless authorized by ENGINEER.

Exceed limitations of ENGINEER's authority as set forth in the Contract Documents.

Undertake any of the responsibilities of CONTRACTOR, Subcontractors, or CONTRACTOR's superintendent.

Advise on, or issue directions relative to or assume control over any aspect of the means, methods, techniques, sequences or procedures for construction unless such is specifically called for in the Contract Documents.

Advise on or issue directions regarding or assume control over safety precautions and programs in connection with the Work.

Shall not accept Shop Drawings or sample submittals from anyone other than CONTRACTOR.

Authorize OWNER to occupy the Work in whole or in part.

Participate in specialized field or laboratory tests or inspections conducted by others except as specifically authorized by ENGINEER.

Clarifications and Interpretations:

9.4 ENGINEER will issue with reasonable promptness such written clarifications or interpretations of the requirements of the Contract Documents (in the form of Drawings or otherwise) as ENGINEER may determine necessary, which shall be consistent with the intent of and reasonably inferable from Contract Documents. Such written clarifications and interpretations will be binding on OWNER and CONTRACTOR. If OWNER or CONTRACTOR believes that a written clarification or interpretation justifies an adjustment in the Contract Price or the Contract Times and the parties are unable to agree to the amount or extent thereof, if any, OWNER or CONTRACTOR may make a written claim therefor as provided in Article 11 or Article 12.

Authorized Variations in Work:

9.5 ENGINEER may authorize minor variations in the work from the requirements of the Contract Documents which do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. These may be accomplished by a Field Order and will be binding on OWNER and also on CONTRACTOR who shall perform the Work involved promptly.

Rejecting Defective Work:

9.6 ENGINEER will have authority to disapprove or reject Work which ENGINEER believes to be **defective**, or that ENGINEER believes will not produce a completed Project that conforms to the Contract Documents or that will prejudice the integrity of the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. ENGINEER will also have authority to require special inspection or testing of the work as provided in paragraph 13.9, whether or not the work is fabricated, installed or completed.

Shop Drawings, Change Orders and Payments:

9.7 In connection with ENGINEER's authority as to Shop Drawings and Samples, see paragraphs 6.24 through 6.28 inclusive.

9.8 In connection with Engineer's authority as to Change Orders, see Articles 10, 11, and 12.

9.9 In connection with ENGINEER's authority as to Applications for Payment, see Article 14.

Determinations for Unit Prices:

9.10 ENGINEER will have authority to determine the actual quantities and classifications of items of Unit Price Work performed by CONTRACTOR, and the written decisions of ENGINEER on such matters will be final, binding on OWNER and CONTRACTOR and not subject to appeal (except as modified by ENGINEER to reflect changed factual conditions).

Decisions on Disputes:

9.11 ENGINEER will be the initial interpreter of the requirements of the Contract Documents and judge of the acceptability of the Work thereunder. Claims, disputes and other matters relating to the acceptability of the Work or the interpretation of the requirements of the Contract Documents pertaining to the performance and furnishing of the Work and Claims under Articles 11 and 12 in respect of changes in the Contract Price or Contract Times will be referred initially to ENGINEER in writing with a request for a formal decision in accordance with this paragraph. Written notice of each such claim, dispute or other matter will be delivered by the claimant to ENGINEER and the other party to the Agreement promptly (but in no event later than fifteen days) after the start of the occurrence or event giving rise thereto, and written supporting data will be submitted to ENGINEER and the other party within thirty days after the start of such occurrence or event unless ENGINEER allows an additional period of time for the submission of additional or more accurate data in support of such claim, dispute of other matter. The opposing party shall submit any response to ENGINEER and the claimant within thirty days after receipt of the claimant's last submittal (unless ENGINEER allows additional time). ENGINEER will render a formal decision in writing within thirty days after receipt of the opposing party's submittal, if any, in accordance with this paragraph. ENGINEER's written decision on such claim, dispute or other matter will be final and binding upon OWNER and CONTRACTOR.

9.12 When functioning under paragraphs 9.10 and 9.11, ENGINEER will not show partiality to OWNER or CONTRACTOR and will not be liable in connection with any interpretation or decision rendered in good faith in such capacity. The rendering of a decision by ENGINEER pursuant to paragraphs 9.10 or 9.11 with respect to any such claim, dispute or other matter (except any which have been waived by the making or acceptance of final payment as provided in paragraph 14.15) will be a condition precedent to any exercise by OWNER or CONTRACTOR of such rights or remedies as either may otherwise have under the Contract Documents or by Laws or Regulations.

9.13 Limitations on ENGINEER's Authority and Responsibilities:

9.13.1 Neither ENGINEER's authority or responsibility under this Article 9 or under any other provision of the Contract Documents nor any decision made by ENGINEER in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise or performance of any authority or responsibility by ENGINEER shall create, impose or give rise to any duty owned by ENGINEER to CONTRACTOR, any Subcontractor, any Supplier, any other person or organization, or to any surety for or employee or agent of any of them.

9.13.2 ENGINEER will not supervise, direct, control or have authority over or be responsible for CONTRACTOR's means, methods, techniques, sequences or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of CONTRACTOR to comply with Laws and Regulations applicable to the furnishing or performance of the Work. ENGINEER will not be responsible for CONTRACTOR's failure to perform or furnish the Work in accordance with the Contract Documents.

9.13.3 ENGINEER will not be responsible for the acts or omissions of CONTRACTOR or of any Subcontractor, any Supplier, or of any other person or organization performing or furnishing any of the Work.

9.13.4 ENGINEER's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds and certificates of inspection, tests and approvals and other documentation required to be delivered by paragraph 14.12 will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests and approvals that the results certified indicate compliance with, the Contract Documents.

9.13.5 The limitations upon authority and responsibility set forth in this paragraph 9.13 shall also apply to ENGINEER's Consultants. Resident Project Representative and assistants.

ARTICLE 10 - CHANGES IN THE WORK

10.1 Without invalidating the Agreement and without notice to any surety, OWNER may, at any time or from time to time, order additions, deletions or revisions in the Work. Such additions, deletions or revisions will be authorized by a Written Amendment, a Change Order, or a Work Change Directive. Upon receipt of any such document, CONTRACTOR shall promptly proceed with the Work involved, which will be performed under the applicable conditions of the Contract Documents (except as otherwise specifically provided).

10.2 If OWNER and CONTRACTOR are unable to agree as to the extent, if any, of an adjustment in the Contract Price or an adjustment of the Contract Times that should be allowed as a result of a Work Change Directive, a claim may be made therefor as provided in Article 11 or Article 12.

10.3 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 and supplemented as provided in paragraphs 3.5 and 3.6 except in the case of an emergency as provided in paragraph 6.23 or in the case of uncovering Work as provided in paragraph 13.9.

10.4 OWNER and CONTRACTOR shall execute appropriate Change Orders recommended by ENGINEER (or Written Amendments) covering:

10.4.1 changes in the Work which are (i) ordered by OWNER pursuant to paragraph 10.1., (ii) required because of acceptance of **defective** Work under paragraph 13.13 or correcting **defective** Work under paragraph 13.14, or (iii) agreed to by the parties:

10.4.2 changes in the Contract Price or Contract Times which are agreed to by the parties; and

10.4.3 changes in the Contract Price or Contract Times, which embody the substance of any written decision rendered by ENGINEER pursuant to paragraph 9.11;

10.5 If notice of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Times) is required by the provisions of any Bond to be given to a surety, the giving of any such notice will be CONTRACTOR's responsibility, and the amount of each applicable Bond will be adjusted accordingly.

ARTICLE 11 - CHANGE OF CONTRACT PRICE

11.1 The Contract Price constitutes the total compensation (subject to authorized adjustments) payable to CONTRACTOR for performing the Work. All duties, responsibilities and obligations assigned to or undertaken by CONTRACTOR shall be at CONTRACTOR's expense without change in the Contract Price.

11.2 The Contract Price may only be changed by a Change Order or by a Written Amendment. Any claim for an adjustment in the Contract Price shall be based on written notice delivered by the party making the claim to the other party and to ENGINEER promptly (but in no event later than fifteen days) after the start of the occurrence or event giving rise to the claim and stating the general nature of the claim. Notice of the amount of the claim with supporting data shall be delivered within thirty days after the start of such occurrence or event (unless ENGINEER allows additional time for claimant to submit additional or more accurate data in support of the claim) and shall be accompanied by claimant's written statement that the adjustment claimed covers all known amounts to which the claimant is entitled as a result of said occurrence or event. All claims for adjustment in the Contract Price shall be determined by ENGINEER in accordance with paragraph 9.11 if OWNER and CONTRACTOR cannot otherwise agree on the amount involved. No claim for ad adjustment in the Contract Price will be valid if not submitted in accordance with this paragraph 11.2.

11.3 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:

11.3.1 where the Work involved is covered by unit prices contained in the Contract Documents, by application of such unit prices to the quantities of the items involved (subject to the provisions of paragraphs 11.9.1 through 11.9.3 inclusive);

11.3.2 where the Work involved is not covered by unit prices contained in the Contract Documents, by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with paragraph 11.6.2);

11.3.3 where the Work involved is not covered by unit prices contained in the Contract Documents and agreement to a lump sum is not reached under paragraph 11.3.2, on the basis of the Cost of the Work (determined as provided in paragraphs 11.4 and 11.5) plus a CONTRACTOR's fee for overhead and profit (determined as provided in paragraph 11.6).

Cost of the Work:

11.4 The term Cost of the Work means the sum of all costs necessarily incurred and paid by CONTRACTOR in the proper performance of the Work. Except as otherwise may be agreed to in writing by OWNER, such costs shall be in amounts no higher than those prevailing in the locality of the Project, shall include only the following items and shall not include any of the costs itemized in paragraph 11.5:

11.4.1 Certified payroll record costs for employees in the direct employment of CONTRACTOR in the performance of the Work under schedules of job classifications shall be submitted to the ENGINEER with the claim. Such employees shall include without limitation superintendents, foremen and other personnel employed full-time at the site. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits which shall include social security contributions, unemployment, excise and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, vacation and holiday pay applicable thereto. The expenses of performing Work after regular working hours, on Saturday, Sunday or legal holidays, shall be included in the above to the extent authorized by OWNER.

11.4.2 Invoices for cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith shall be submitted to the ENGINEER with the claim. All cash discounts shall accrue to CONTRACTOR unless OWNER deposits funds with CONTRACTOR with which to make payments, in which case the cash discounts shall accrue to OWNER. All trade discounts, rebates and refunds and returns from sale of surplus materials and equipment shall be in accordance with the State Department of Highways, Division of Highways, and State of Colorado Standard Specifications for Road and Bridge Construction 2005 Edition. If the materials used in performing the extra Work are taken from the CONTRACTOR's stock, then in lieu of invoices the CONTRACTOR shall furnish an affidavit, certifying that such materials were taken from its stock, that the quantity claimed was actually used in the Work, and that the price and transportation claimed represent the actual cost to the CONTRACTOR shall be submitted to the ENGINEER with the claim.

11.4.3 Payments made by CONTRACTOR to the Subcontractors for Work performed or furnished by Subcontractors. If required by OWNER, CONTRACTOR shall obtain competitive bids from subcontractors acceptable to OWNER and CONTRACTOR and shall deliver such bids to OWNER who will then determine, with the advice of ENGINEER, which bids, if any, will be accepted. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work Plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as CONTRACTOR's Cost of the Work and fee as provided in paragraphs 11.4, 11.5, 11.6 and 11.7. All subcontracts shall be subject to the other provisions of the Contract Documents insofar as applicable.

11.4.4 Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys and accountants) employed for services specifically related to the Work.

11.4.5 Supplemental costs including the following:

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

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

11.4.5.3 Rentals rates of all construction equipment and machinery and the parts thereof which has been authorized by the ENGINEER, the CONTRACTOR will be paid for the use of equipment in the manner hereinafter specified. Rental rates will be from the current edition of the Rental Rate Blue Book for Construction Equipment and will be determined as follows:

Hourly rate: RR = (ADJ BB/176)(RF)(SAF)+EOC

Where: RR = Hourly rental rate
ADJ BB/176 = Blue Book Monthly Rate adjusted for year of manufacture/176
RF = Regional Factor of 1.06
SAF = State Adjustment Factor of 1.05
EOC = Estimated Hourly Operating Costs from Blue Book

With each claim, the CONTRACTOR shall submit the rental rate calculations including copies of the appropriate pages of the Blue Book for each piece of equipment listed in the claim.

Rental of equipment not owned by the CONTRACTOR will be paid for by invoice cost plus operating cost (EOC). Copies of the applicable pages of the Rental Rate Blue Book for Construction Equipment shall be submitted to the ENGINEER with the claim.

The costs of transportation, loading, unloading, installation, dismantling, and removal thereof all in accordance with the terms of said rental agreements. If equipment is used intermittently and when not in use could be returned to its rental source at less expense to the OWNER than holding it at the Work site, it shall be returned unless the CONTRACTOR elects to keep it at the Work site at no expense to the OWNER. The rental of any such equipment, machinery or parts shall cease when the use of the equipment is no longer necessary for the Work. No payment will be made for the use of tools, which have a replacement value of $200.00 or less. Operators will be paid for separately as provided in paragraph 11.4.1. Certified invoices for rental cost of all construction equipment and machinery incorporated in the Work shall be submitted to the ENGINEER with the claim.

11.4.5.4 Sales, consumer, use or similar taxes related to the Work, and for which CONTRACTOR is liable, imposed by Laws and Regulations.

11.4.5.5 Deposits lost for causes other than negligence of CONTRACTOR, any Subcontractor or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable.

11.4.5.6 Losses and damages (and related expenses) caused by damage to the work, not compensated by insurance or otherwise, sustained by CONTRACTOR in connection with the performance and furnishing of the Work, (except losses and damages within the deductible amounts of property insurance established by OWNER in accordance with paragraph 5.9), provided they have resulted from causes other than the negligence of CONTRACTOR, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of OWNER. No such losses, damages and expenses shall be included in the Cost of the Work for the purpose of determining CONTRACTOR's fee. If, however, any such loss or damage requires reconstruction and CONTRACTOR is placed in charge thereof, CONTRACTOR shall be paid for services a fee proportionate to that stated in paragraph 11.6.2.

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

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

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

11.5.1 Payroll costs and other compensation of CONTRACTOR's officers, executives, principals (of partnership and sole proprietorships), general managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expediters, timekeepers, clerks and other personnel employed by CONTRACTOR whether at the site or in CONTRACTOR's principal or a branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in paragraph 11.4.1 or specifically covered by paragraph 11.4.4--all of which are to be considered administrative costs covered by the CONTRACTOR's fee.

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

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

11.5.4 Cost of premiums for all Bonds and for all insurance whether or not CONTRACTOR is required by the Contract Documents to purchase and maintain the same. (except for the cost of premiums covered by subparagraph 11.4.5.9 above).

11.5.5 Costs due to the negligence of CONTRACTOR, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of **defective** Work, disposal of materials or equipment wrongly supplied and making good any damage to property.

Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in paragraph 11.4.

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

11.6.1 a mutually acceptable fixed fee; or

11.6.2 if a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the work:

11.6.2.1 for costs incurred under paragraphs 11.4.1 and 11.4.2, the CONTRACTOR's fee shall be fifteen percent;

11.6.2.2 for costs incurred under paragraph 11.4.3, the CONTRACTOR's fee shall be five percent;

11.6.2.3 where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of paragraphs 11.4.1, 11.4.2, 11.4.3 and 11.6.2 is that the Subcontractor who actually performs or furnishes the Work, at whatever tier, will be paid a fee of fifteen percent of the costs incurred by such Subcontractor under paragraphs 11.4.1 and 11.4.2 and that any higher tier Subcontractor and CONTRACTOR will each be paid a fee of five percent of the amount paid to the next lower tier Subcontractor;

11.6.2.4 no fee shall be payable on the basis of costs itemized under paragraphs 11.4.4, 11.4.5 and 11.5;

11.6.2.5 the amount of credit to be allowed by CONTRACTOR to OWNER for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in CONTRACTOR's fee by an amount equal to five percent of such net decrease; and

11.6.2.6 when both additions and credits are involved in any one change, the adjustment in CONTRACTOR's fee shall be computed on the basis of the net change in accordance with paragraphs 11.6.2.1 through 11.6.2.5, inclusive.

11.7 Whenever the cost of any Work is to be determined pursuant to paragraphs 11.4 and 11.5, CONTRACTOR will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in form acceptable to ENGINEER an itemized cost breakdown together with supporting data.

Cash Allowances:

11.8 It is understood that CONTRACTOR has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be furnished and performed for such sums as may be acceptable to OWNER and ENGINEER. CONTRACTOR agrees that:

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

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

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

11.9 Unit Price Work:

11.9.1 Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the established unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Determinations of the actual quantities and classifications of Unit Price Work performed by CONTRACTOR will be made by ENGINEER in accordance with paragraph 9.10.

11.9.2 Each unit price will be deemed to include an amount considered by CONTRACTOR to be adequate to cover CONTRACTOR's overhead and profit for each separately identified item.

11.9.3 OWNER or CONTRACTOR may make a claim for an adjustment in the contract Price in accordance with Article 11 if:

11.9.3.1 the quantity of any item of Unit Price Work performed by CONTRACTOR differs materially and significantly from the estimated quantity of such item indicated in the Agreement; and

11.9.3.2 there is no corresponding adjustment with respect to any other item of Work; and

11.9.3.3 if CONTRACTOR believes that CONTRACTOR is entitled to an increase in Contract Price as a result of having incurred additional expense or OWNER believes that OWNER is entitled to a decrease in Contract Price and the parties are unable to agree as to the amount of any such increase or decrease.

ARTICLE 12 - CHANGE OF CONTRACT TIMES

12.1 The Contract Times (or Milestones) may only be changed by a Change Order or a Written Amendment. Any claim for an adjustment of the Contract Times (or Milestones) shall be based on written notice delivered by the party making the claim to the other party and to ENGINEER promptly (but in no event later than fifteen days) after the occurrence of the event giving rise to the claim and stating the general nature of the claim. Notice of the extent of the claim with supporting data shall be delivered within thirty days after such occurrence (unless ENGINEER allows an additional period of time to ascertain more accurate data in support of the claim) and shall be accompanied by the claimant's written statement that the adjustment claimed is the entire adjustment to which the claimant has reason to believe it is entitled as a result of the occurrence of said event. All claims for adjustment in the Contract Times (or Milestones) shall be determined by ENGINEER in accordance with paragraph 9.11 if OWNER and CONTRACTOR cannot otherwise agree. No claim for an adjustment in the Contract Times (or Milestones) will be valid if not submitted in accordance with the requirements of this paragraph 12.1.

12.2 Liquidated damages. The OWNER and the CONTRACTOR agree and recognize that time is of the essence for every time period set forth in the Contract Documents and that the OWNER will suffer financial loss if the Work is not substantially complete within the time set forth in the Contract Documents, plus any extensions thereof allowed in accordance with this Article 12 of the General Conditions. If the CONTRACTOR fails to perform the Work within the specified time set forth in the Contract Documents as adjusted pursuant to Article 12, the OWNER and CONTRACTOR agree that as liquidated damages, and not as a penalty, for delay in performance the Contractor shall pay OWNER in the amount stipulated below for each and every contract day that expires after the time set forth in the Contract Documents for Substantial Completion of the Work until the same is finally complete and ready for Final Payment. The OWNER shall have the right to deduct liquidated damages from any amount due or that may become due to the CONTRACTOR, or to collect such liquidated damages from the CONTRACTOR or the Surety. The OWNER has the option to enforce liquidated damages or to waive such damages. The liquidated damages herein specified shall only apply to the CONTRACTOR's delay in performance. Liquidated damages are intended only to compensate the OWNER for additional OWNER personnel efforts in administering the Contract after normally scheduled completion dates, and for City governmental and citizen inconvenience, lost opportunities, and lost confidence in government and morale of government when work is not completed on time. Such damages are uncertain in amount and difficult to measure and prove accurately. By executing this contract, the CONTRACTOR agrees that the liquidated damages specified in the Contract Documents are reasonable in amount and are not disproportionate to actual anticipated damages. Liquidated damages do not include any sums of money to reimburse the OWNER for extra costs which the OWNER may become obligated to pay on other contracts which are delayed or extended because of CONTRACTOR's failure to complete the Work within the time periods set forth in the Contract Documents. Liquidated damages are not intended to include litigation or attorneys' fees incurred by the OWNER, or other incidental or consequential damages suffered by the OWNER due to the Contractor's performance. If the OWNER charges liquidated damages to the CONTRACTOR, this shall not preclude the Owner from commencing an action against the CONTRACTOR for other actual harm resulting from the CONTRACTOR's performance, which is not due to the CONTRACTOR's delay in performance. In order to recover liquidated damages, OWNER is under no obligation to prove the actual damages sustained by OWNER due to the CONTRACTOR's delay in performance. In no event shall the CONTRACTOR be assessed liquidated damages if the contract is suspended or terminated for events beyond the control

of the CONTRACTOR for which a time extension beyond the original schedule of performance could be granted under 12.3.

The parties agree that liquidated damages shall be in the amount set forth in Article 2 of the Agreement.

12.3 Where CONTRACTOR is prevented from completing any part of the Work within the Contract Times (or Milestones) due to delay beyond the control of CONTRACTOR, the Contract Times (or Milestones) will be extended in an amount equal to the time lost due to such delay if a claim is made therefor as provided in paragraph 12.1. Delays beyond the control of CONTRACTOR shall include, but not be limited to, acts or neglect by OWNER, acts or neglect of utility owners or other contractors performing other work as contemplated by Article 7, fires, floods, epidemics, abnormal weather conditions or acts of God. Delays attributable to and within the control of a Subcontractor or Supplier shall be deemed to be delays within the control of CONTRACTOR.

12.4 The CONTRACTOR specifically waives any and all claims against the OWNER for damages resulting from any hindrance or delay caused by circumstances beyond the control of CONTRACTOR that prevents completing any part of the Work within the Contract Times (or Milestones), whether or not caused by the OWNER. The CONTRACTOR may instead be granted an extension of the Contract Times for which the OWNER will not claim liquidated damages, provided that the hindrance or delay is beyond the control of the CONTRACTOR. An extension of the Contract Times (or Milestones) in an amount equal to the time lost due to such delay shall be CONTRACTOR's sole and exclusive remedy for such delay. In no event shall OWNER be liable to CONTRACTOR, any subcontractor, any supplier, any other person or organization, or to any surety for or employee or agent of any of them, for damages arising out of or resulting from delays caused by or within the control of Contractor, or delays beyond the control of CONTRACTOR whether or not caused by the OWNER.

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

Notice of Defects:

13.1 Prompt notice of all **defective** Work of which OWNER or ENGINEER has actual knowledge will be given to CONTRACTOR. All **defective** Work may be rejected, corrected or accepted as provided in this Article 13.

Access to Work:

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

Tests and Inspections:

13.3 CONTRACTOR shall give ENGINEER timely notice of readiness of the Work for all required inspections, tests or approvals, and shall cooperate with inspection and testing personnel to facilitate required inspections or tests.

13.4 OWNER shall employ and pay for the services of an independent testing laboratory to perform all inspections, tests, or approvals required by the Contract Documents except:

13.4.1 for inspections, tests or approvals covered by paragraph 13.5 below:

13.4.2 that costs incurred in connection with tests or inspections conducted pursuant to paragraph 13.9 below shall be paid as provided in said paragraph 13.9; and

13.4.3 as otherwise specifically provided in the Contract Documents.

13.4.4 any and all retesting of soil necessitated by the CONTRACTOR's operations or inability to obtain specified density test results on the first attempt shall be the sole responsibility and costs of the CONTRACTOR to achieve required passing test results. Retesting required because of non-conformance to specified requirements shall be performed by the independent firm employed by the OWNER. Payment for retesting will be charged to the CONTRACTOR by deducting inspection, testing and administrative charges from the Contract Price.

13.5 If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested or approved by an employee or other representative of such public body, CONTRACTOR shall assume full responsibility for arranging and obtaining such inspections, tests or approvals, pay all costs in connection therewith, and furnish ENGINEER the required certificates of inspection, or approval. CONTRACTOR shall also be responsible for arranging and obtaining and shall pay all costs in connection with any inspections, tests or approvals required for OWNER's and ENGINEER's acceptance of materials or equipment to be incorporated in the Work, or of materials, mix designs, or equipment submitted for approval prior to CONTRACTOR's purchase thereof for incorporation in the Work.

13.6 If any Work (or the work of others) that is to be inspected, tested or approved is covered by CONTRACTOR without written concurrence of ENGINEER, it must, if requested by ENGINEER, be uncovered for observation.

13.7 Uncovering Work as provided in paragraph 13.6 shall be at CONTRACTOR's expense unless CONTRACTOR has given ENGINEER timely notice of CONTRACTOR's intention to cover the same and ENGINEER has not acted with reasonable promptness in response to such notice.

Uncovering Work:

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

13.9 If ENGINEER considers it necessary or advisable that covered Work be observed by ENGINEER or inspected or tested by others, CONTRACTOR, at ENGINEER's request, shall uncover, expose or otherwise make available for observation, inspection or testing as ENGINEER may require, that portion of the Work in question, furnishing all necessary labor, material and equipment. If it is found that such Work is **defective,** CONTRACTOR shall pay

all claims, costs, losses and damages caused by, arising out of or resulting from such uncovering, exposure, observation, inspection and testing and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and OWNER shall be entitled to an appropriate decrease in the Contract Price, and, if the parties are unable to agree as to the amount thereof, may make a claim therefor as provided in Article 11.

OWNER May Stop the Work:

13.10 If the Work is **defective**, or CONTRACTOR fails to supply sufficient skilled workers or suitable materials or equipment, or fails to furnish or perform the Work in such a way that the completed Work will conform to the Contract Documents, OWNER may order CONTRACTOR to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of OWNER to stop the Work shall not give rise to any duty on the part of OWNER to exercise this right for the benefit of CONTRACTOR or any surety or other party.

Correction or Removal of Defective Work:

13.11 If required by ENGINEER, CONTRACTOR shall promptly, as directed, either correct all **defective** Work, whether or not fabricated, installed or completed, or, if the Work has been rejected by ENGINEER, remove it from the site and replace it with Work that is not **defective.** CONTRACTOR shall pay all claims, costs, losses and damages caused by or resulting from such correction or removal (including but not limited to all costs of repair or replacement of work of others).

13.12 Correction Period:

13.12.1 If within one year after the date of Final Completion or such longer period of time as may be prescribed by Laws or Regulations or by the terms of any applicable special guarantee required by the Contract Documents or by any specific provision of the Contract Documents, any Work is found to be defective, CONTRACTOR shall within seven calendar days after receiving notice from OWNER, without cost to OWNER and in accordance with OWNER's written instructions: (i) correct such defective Work, or if its has been rejected by OWNER, remove it from the site and replace it with WORK that is not defective, and (ii) satisfactorily correct or remove and replace any damage to other Work or the work of others resulting therefrom. If CONTRACTOR does not within seven calendar days after receiving notice from OWNER comply with the terms of such instructions, or in an emergency where delay would cause serious risk of loss or damage, OWNER may have the defective Work corrected or the rejected Work removed and replaced, and all claims, costs, losses and damages caused by or resulting from such removal and replacement (including but not limited to all costs of repair or replacement of work of others) will be paid by CONTRACTOR.

13.12.2 In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications or by Written Amendment.

13.12.3 Where **defective** Work (and damage to other Work resulting therefrom) has been corrected, removed or replaced under this paragraph 13.12, the

correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.

Acceptance of Defective Work:

13.13 If, instead of requiring correction or removal and replacement of **defective** Work, OWNER (and, prior to ENGINEER's recommendation of final payment, also ENGINEER) prefers to accept it, OWNER may do so. CONTRACTOR shall play all claims, costs, losses and damages attributable to OWNER's evaluation of and determination to accept such **defective** Work (such costs to be approved by ENGINEER as to reasonableness). If any such acceptance occurs prior to ENGINEER's recommendation of final payment, a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work; and OWNER shall be entitled to an appropriate decrease in the Contract Price, and, if the parties are unable to agree as to the amount thereof, OWNER may make a claim therefor as provided in Article 11. If the acceptance occurs after such recommendation, an appropriate amount will be paid by CONTRACTOR to OWNER.

OWNER May Correct Defective Work:

13.14 If CONTRACTOR fails within a reasonable time after written notice from ENGINEER to correct **defective** Work or to remove and replace rejected Work as required by ENGINEER in accordance with paragraph 13.11, or if CONTRACTOR fails to perform the Work in accordance with the Contract Documents, or if CONTRACTOR fails to comply with any other provision of the Contract Documents, OWNER may, after seven days' written notice to CONTRACTOR, correct and remedy any such deficiency. In exercising the rights and remedies under this paragraph OWNER shall proceed expeditiously. In connection with such corrective and remedial action, OWNER may exclude CONTRACTOR from all or part of the site, take possession of all or part of the Work, and suspend CONTRACTOR's services related thereto, take possession of CONTRACTOR's tools, appliances, construction equipment and machinery at the site and incorporate in the Work all materials and equipment stored at the site or for which OWNER has paid CONTRACTOR but which are stored elsewhere. CONTRACTOR shall allow OWNER, OWNER's representatives, agents and employees, OWNER's other contractors and ENGINEER and ENGINEER's Consultants access to the site to enable OWNER to exercise the rights and remedies under this paragraph. All claims, costs, losses and damages incurred or sustained by OWNER in exercising such rights and remedies will be charged against CONTRACTOR and a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work; and OWNER shall be entitled to an appropriate decrease in the Contract Price, and, if the parties are unable to agree as to the amount thereof, OWNER may make a claim therefor as provided in Article 11. Such claims, costs, losses and damages will include but not be limited to all costs of repair or replacement of work of others destroyed or damaged by correction, removal or replacement of CONTRACTOR's **defective** Work. CONTRACTOR shall not be allowed an extension of the Contract Times (or Milestones) because of any delay in the performance of the Work attributable to the exercise by OWNER of OWNER's rights and remedies hereunder.

ARTICLE 14 - PAYMENTS TO CONTRACTOR AND COMPLETION

Schedule of Values:

14.1 Progress payments on account of Unit Price Work will be based on the number of units completed.

Application for Progress Payment:

14.2 At least twenty days before the date established for each progress payment (but not more often than once a month), CONTRACTOR shall submit to ENGINEER for review an Application for Payment filled out and signed by CONTRACTOR covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice or other documentation warranting that OWNER has received the materials and equipment free and clear of all Liens, claims, security interests, or encumbrances and evidence that the materials and equipment are covered by appropriate property insurance and other arrangements to protect OWNER's interest therein, all of which will be satisfactory to OWNER. The amount of retainage with respect to progress payments will be as stipulated in the Agreement. With each application for payment the CONTRACTOR shall submit a notarized waiver(s) of claim signed by the CONTRACTOR acceptable in form to the ENGINEER. The waiver of claim for payment for the work of the CONTRACTOR shall equal the amount of the previous payment distributed to the CONTRACTOR for work of the CONTRACTOR and the amount of the total previous payment distributed to the CONTRACTOR.

CONTRACTOR's Warranty of Title:

14.3 CONTRACTOR warrants and guarantees that title to all Work, materials and equipment covered by any Application for Payment, whether incorporated in the Project or not, will pass to OWNER no later than the time of payment free and clear of all Liens.

Review of Applications for Progress Payment:

14.4 ENGINEER will, within ten days after receipt of each Application for Payment, either indicate in writing a recommendation of payment and present the Application to OWNER, or return the Application to CONTRACTOR indicating in writing ENGINEER's reasons for refusing to recommend payment. In the latter case, CONTRACTOR may make the necessary corrections and resubmit the Application. Ten days after presentation of the Application for Payment to OWNER with ENGINEER's recommendation, the amount recommended will (subject to the provisions of the last sentence of paragraph 14.7) become due and when due will be paid by OWNER to CONTRACTOR.

14.5 ENGINEER's recommendation of any payment requested in an Application for Payment will constitute a representation by ENGINEER to OWNER, based on ENGINEER's on-site observations of the executed Work as an experienced and qualified design professional and on ENGINEER's review of the Application for Payment and the accompanying data and schedules, that to the best of ENGINEER's knowledge, information and belief:

14.5.1 the Work has progressed to the point indicated.

14.5.2 the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, to the results of any subsequent tests called for in the Contract Documents, to a final determination of quantities and classifications for Unit

Price Work under paragraph 9.10 and to any other qualifications stated in the recommendation), and

14.5.3 the conditions precedent to CONTRACTOR's being entitled to such payment appear to have been fulfilled insofar as it is ENGINEER's responsibility to observe the Work.

However, by recommending any such payment ENGINEER will not thereby be deemed to have represented that: (i) exhaustive or continuous on-site inspections have been made to check the quality or the quantity of the Work beyond the responsibilities specifically assigned to ENGINEER in the Contract Documents or (ii) that there may not be other matters or issues between the parties that might entitle CONTRACTOR to be paid additionally by OWNER or entitle OWNER to withhold payment to CONTRACTOR.

14.6 ENGINEER's recommendation of any payment, including final payment, shall not mean that ENGINEER is responsible for CONTRACTOR's means, methods, techniques, sequences or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of CONTRACTOR to comply with Laws and Regulations applicable to the furnishing or performance of Work, or for any failure of CONTRACTOR to perform or furnish Work in accordance with the Contract Documents.

14.7 ENGINEER may refuse to recommend the whole or any part of any payment if, in ENGINEER's opinion, it would be incorrect to make the representations to OWNER referred to in paragraph 14.5. ENGINEER may also refuse to recommend any such payment, or, because of subsequently discovered evidence or the results of subsequent inspections or tests, nullify any such payment previously recommended, to such extent as may be necessary in ENGINEER's opinion to protect OWNER from loss because:

14.7.1 the Work is **defective**, or completed Work has been damaged requiring correction or replacement,

14.7.2 the Contract Price has been reduced by Written Amendment or Change Order,

14.7.3 OWNER has been required to correct **defective** Work or complete Work in accordance with paragraph 13.14, or

14.7.4 ENGINEER has actual knowledge of the occurrence of any of the events enumerated in paragraphs 15.2.1 through 15.2.3 inclusive.

In addition to the retainages set forth in the Contract Documents, the Owner may retain one hundred percent (100%) of all progress payments for any unsatisfactory performance of the Work and any payment recommended by the ENGINEER, including without limitation:

Defective work or failure to repair or replace defective work;

Claims filed against the CONTRACTOR, or reasonable evidence indicating probable filing of such claims;

Failure of the CONTRACTOR to make adequate or proper payments to subcontractors or suppliers for materials, equipment or labor;

Failure to obtain necessary permits or licenses, or to comply with applicable laws, ordinances, codes, or regulations, unless such noncompliance is due to reasons

beyond the control of the CONTRACTOR, or due to act of the OWNER or and ENGINEER hired by the OWNER, or agents or employees thereof:

Reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Price then unpaid;

Reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay;

Persistent failure to carry out the Work in accordance with the Contract Documents;

As a set off for amounts due the Owner on other items;

Collusion with other bidders in preparing the bid;

Actual knowledge of the occurrence of any of the events enumerated in paragraphs 14.7.1 through 14.7.3 or paragraphs 15.2.1 through 15.2.4 inclusive.

When the above reasons for withholding payment are removed and corrected to the OWNER's satisfaction, OWNER shall make payment to the CONTRACTOR of the sums withheld pursuant to this paragraph, subject to the amounts required to be retained by the Contract Documents.

Progress Payments to Suppliers and Subcontractors. The CONTRACTOR shall make partial payments of the amount due to each of the CONTRACTOR's suppliers and subcontractors in the same manner as the OWNER is required to pay the CONTRACTOR under Article 4 of the Agreement and Article 14 of the General Conditions, provided that the suppliers and subcontractors are performing to the CONTRACTOR's satisfaction. If the OWNER is notified that the CONTRACTOR is in arrears in payments to the CONTRACTOR's suppliers or subcontractors, the OWNER shall notify the CONTRACTOR and determine why such funds are being withheld. If the OWNER determines that no legitimate basis exists for the CONTRACTOR's withholding of such payments, the OWNER may, five (5) days after the mailing of written notice to the CONTRACTOR, make such payments directly to the CONTRACTOR's suppliers or subcontractors from funds which otherwise would be due the CONTRACTOR.

Substantial Completion:

14.8 When CONTRACTOR considers the entire Work ready for its intended use CONTRACTOR shall notify OWNER and ENGINEER in writing that the entire Work is substantially complete (except for items specifically listed by CONTRACTOR as incomplete) and request that ENGINEER issue a certificate of Substantial Completion. Within a reasonable time thereafter, OWNER, CONTRACTOR and ENGINEER shall make an inspection of the Work to determine the status of completion. If ENGINEER does not consider the Work substantially complete, ENGINEER will notify CONTRACTOR in writing giving the reasons therefor. If ENGINEER considers the Work substantially complete, ENGINEER will prepare and deliver to OWNER a tentative certificate of Substantial Completion, which shall fix the date of Substantial Completion. There shall be attached to the certificate a tentative list of items to be completed or corrected before final payment. OWNER shall have seven days after receipt of the tentative certificate during which to make written objection to ENGINEER as to any provisions of the certificate or attached list. If, after considering such objections, ENGINEER concludes that the Work is not substantially complete, ENGINEER will within fourteen days after submission of the tentative certificate to OWNER notify CONTRACTOR in writing, stating the reasons therefor. If, after consideration of OWNER's objections,

ENGINEER considers the Work substantially complete, ENGINEER will within said fourteen days execute and deliver to OWNER and CONTRACTOR a definitive certificate of Substantial Completion (with a revised tentative list of items to be completed or corrected) reflecting such changes from the tentative certificate as ENGINEER believes justified after consideration of any objections from OWNER. At the time of delivery of the tentative certificate of Substantial Completion, ENGINEER will deliver to OWNER and CONTRACTOR a written recommendation as to division of responsibilities pending final payment between OWNER and CONTRACTOR with respect to security, operation, safety, maintenance, heat, utilities, insurance and warranties and guarantees. Unless OWNER and CONTRACTOR agree otherwise in writing and so inform ENGINEER in writing prior to ENGINEER's issuing the definitive certificate of Substantial Completion. ENGINEER's aforesaid recommendation will be binding on OWNER and CONTRACTOR until final payment.

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

Partial Utilization:

14.10 Use by OWNER at OWNER's option of any substantially completed part of the Work which: (i) has specifically been identified in the Contract Documents, or (ii) OWNER, ENGINEER, and CONTRACTOR agree constitutes a separately functioning and usable part of the Work that can be used by OWNER for its intended purpose without significant interference with CONTRACTOR's performance of the remainder of the Work, may be accomplished prior to Substantial Completion of all the Work subject to the following:

14.10.1 OWNER at any time may request CONTRACTOR in writing to permit OWNER to use any such part of the Work which OWNER believes to be ready for its intended use and substantially complete. If CONTRACTOR agrees that such part of the Work is substantially complete, CONTRACTOR will certify to OWNER and ENGINEER that such part of the Work is substantially complete and request ENGINEER to issue a certificate of Substantial Completion for that part of the Work. CONTRACTOR at any time may notify OWNER and ENGINEER in writing that CONTRACTOR considers any such part of the Work ready for its intended use and substantially complete and request ENGINEER to issue a certificate of Substantial Completion for that part of the Work. Within a reasonable time after either such request, OWNER, CONTRACTOR and ENGINEER shall make an inspection of that part of the Work to determine its status of completion. If ENGINEER does not consider that part of the Work to be substantially complete, ENGINEER will notify OWNER and CONTRACTOR in writing giving the reasons therefor. If ENGINEER considers that part of the Work to be substantially complete, the provisions of paragraphs 14.8 and 14.9 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof land access thereto.

Final Inspection:

14.11 Upon written notice from CONTRACTOR that the entire Work or an agreed portion thereof is complete, ENGINEER will make a final inspection with OWNER and CONTRACTOR and will notify CONTRACTOR in writing of all particulars in which this inspection reveals that the

Work is incomplete or **defective.** CONTRACTOR shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

Final Application for Payment:

14.12 After CONTRACTOR has completed all such corrections to the satisfaction of ENGINEER and delivered in accordance with the Contract Documents all maintenance and operating instructions, schedules, guarantees, Bonds, certificates or other evidence of insurance required by paragraph 5.4, certificates of inspection, marked-up record documents (as provided in paragraph 6.19) and other documents. CONTRACTOR may make application for final payment following the procedure for progress payments. The final application for payment shall be accompanied (except as previously delivered) by: (i) all documentation called for in the Contract Documents, including but not limited to the evidence satisfactory to the OWNER of the continuation of completed operations insurance and any insurance coverage written on a claims-made basis at final payment and one year thereafter; (ii) the consent of surety to final payment and that the performance bond shall remain in effect throughout the guarantee period; (iii) complete and legally effective claim releases signed by all suppliers and subcontractors in the form provided in the Contract Documents certifying that all outstanding claims for payment have been paid. The CONTRACTOR shall not receive final payment due under the Agreement until the CONTRACTOR obtains and files the foregoing items (i), (ii), and (iii).

14.12.1 LIENS. Colorado Statutes do not provide for any right of lien against public buildings. In lieu thereof, §38-26-107, Colorado Revised Statutes, as amended, provides adequate relief for any claimant having furnished labor, materials, rental machinery, tools, equipment, or services toward construction of the particular public work in that final payment may not be made to a CONTRACTOR until all such creditors have been put on notice by publication of such pending payment and given opportunity to stop payment to the CONTRACTOR in the amount of such claims. Pursuant to §38-26-107, C.R.S., any supplier may bring a suit and file a notice of lis pendens against the OWNER within ninety (90) days after the date set for final settlement. If any such supplier or person files any such claim and notice of lis pendens, the OWNER shall withhold retained amounts from final payments to the CONTRACTOR as are necessary to satisfy fully such claims. References to liens appearing in Article 14 shall be deemed as references to claims made pursuant to C.R.S §38-26-101 et seq. unless the context requires otherwise.

Final Payment and Acceptance:

14.13 If, on the basis of ENGINEER's observation of the Work during construction and final inspection, and ENGINEER's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, ENGINEER is satisfied that the Work has been completed and CONTRACTOR's other obligations under the Contract Documents have been fulfilled, ENGINEER will, within ten days after receipt of the final Application for Payment, indicate in writing ENGINEER's recommendation of payment and present the Application to OWNER for payment. At the same time ENGINEER will also give written notice to OWNER and CONTRACTOR that the Work is acceptable subject to the provisions of paragraph 14.15. Otherwise, ENGINEER will return the Application to CONTRACTOR, indicating in writing the reasons for refusing to recommend final payment, in which case CONTRACTOR shall make the necessary corrections and resubmit the Application. Upon receipt of the ENGINEER's recommendation for payment and the final

Application for Payment, OWNER shall order the publication of Notice of Final Payment as required by C.R.S. §38-26-107(1) and shall make final payment in accordance with C.R.S. 38-26-107(3).

14.14 If, through no fault of CONTRACTOR, final completion of the Work is significantly delayed and if ENGINEER so confirms, OWNER shall, upon receipt of CONTRACTOR's final Application for Payment and recommendation of ENGINEER, and without terminating the Agreement, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance to be held by OWNER for Work not fully completed or corrected is less than the retainage stipulated in the Agreement, and if Bonds have been furnished as required in paragraph 5.1, the written consent of the surety to the payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by CONTRACTOR to ENGINEER with the Application for such payment. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of claims.

Waiver of Claims:

14.15 The making and acceptance of final payment will constitute:

14.15.1 a waiver of all claims by OWNER against CONTRACTOR, except claims arising from unsettled Liens, from **defective** Work appearing after final inspection pursuant to paragraph 14.11, from failure to comply with the Contract Documents or the terms of any special guarantees specified therein, or from CONTRACTOR's continuing obligations under the Contract Documents; and

14.15.2 a waiver of all claims by CONTRACTOR against OWNER other than those previously made in writing and still unsettled.

ARTICLE 15 - SUSPENSION OF WORK AND TERMINATION

OWNER May Suspend Work:

15.1 At any time and without cause, OWNER may suspend the Work or any portion thereof for a period of not more than ninety days by notice in writing to CONTRACTOR and ENGINEER, which will fix the date on which Work will be resumed. CONTRACTOR shall resume the Work on the date so fixed. CONTRACTOR shall be allowed an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such suspension if CONTRACTOR makes an approved claim therefor as provided in Articles 11 and 12.

OWNER May Terminate:

15.2 Upon the occurrence of any one or more of the following events:

15.2.1 if CONTRACTOR persistently fails to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the progress schedule established under paragraph 2.8 as adjusted from time to time pursuant to paragraph 6.6);

15.2.2 if CONTRACTOR disregards Laws or Regulations of any public body having jurisdiction;

15.2.3 if CONTRACTOR otherwise violates in any substantial way any provisions of the Contract Documents;

OWNER may, after giving CONTRACTOR (and the surety, if any,) seven days' written notice and to the extent permitted by Laws and Regulations, terminate the services of CONTRACTOR, exclude CONTRACTOR from the site and take possession of the Work and of all CONTRACTOR's tools, appliances, construction equipment and machinery at the site and use the same to the full extent they could be used by CONTRACTOR (without liability to CONTRACTOR for trespass or conversion), incorporate in the Work all materials and equipment stored at the site or for which OWNER has paid CONTRACTOR but which are stored elsewhere, and finish the Work as OWNER may deem expedient. In such case CONTRACTOR shall not be entitled to receive any further payment until the Work is finished. If the unpaid balance of the Contract Price exceeds all claims, costs, losses and damages sustained by OWNER arising out of or resulting from completing the Work such excess will be paid to CONTRACTOR. If such claims, costs, losses and damages exceed such unpaid balance, CONTRACTOR shall pay the difference to OWNER. Such claims, costs, losses and damages incurred by OWNER will be reviewed by ENGINEER as to their reasonableness and when so approved by ENGINEER incorporated in a Change Order, provided that when exercising any rights or remedies under this paragraph OWNER shall not be required to obtain the lowest price for the Work performed.

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

15.4 Upon seven days' written notice to CONTRACTOR and ENGINEER, OWNER may, without cause and without prejudice to any other right or remedy of OWNER, elect to terminate the Agreement. In such case, CONTRACTOR shall be paid (without duplication of any items):

15.4.1 for completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;

15.4.2 for expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses;

15.4.3 for all claims, costs, losses and damages incurred in settlement of terminated contracts with Subcontractors, Suppliers and others; and

15.4.4 for reasonable expenses directly attributable to termination.

CONTRACTOR shall not be paid on account of loss of anticipated profits or revenue or other economic loss arising out of or resulting from such termination.

CONTRACTOR May Stop Work or Terminate:

15.5 If, through no act or fault of CONTRACTOR, the Work is suspended for a period of more than ninety days by OWNER or under an order of court or other public authority, or

ENGINEER fails to act on any Application for Payment within thirty days after it is submitted or OWNER fails for thirty days to pay CONTRACTOR any sum finally determined to be due, then CONTRACTOR may, upon seven days' written notice to OWNER and ENGINEER, and provided OWNER or ENGINEER do not remedy such suspension or failure within that time, terminate the Agreement and recover from OWNER payment on the same terms as provided in paragraph 15.4. In lieu of terminating the Agreement and without prejudice to any other right or remedy, if ENGINEER has failed to act on an Application for Payment within thirty days after it is submitted, or OWNER has failed for thirty days to pay CONTRACTOR any sum finally determined to be due, CONTRACTOR may upon seven days' written notice to OWNER and ENGINEER stop the Work until payment of all such amounts due CONTRACTOR, including interest thereon. The provisions of this paragraph 15.5 are not intended to preclude CONTRACTOR from making claim under Articles 11 and 12 for an increase in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to CONTRACTOR's stopping Work as permitted by this paragraph.

ARTICLE 16 - MISCELLANEOUS

Giving Notice:

16.1 Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended, or if delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the giver of the notice.

Computation of Times:

16.2.1 When any period of time is referred to in the Contract Documents by days, it will be computed to include the first and the last day of such period.

Notice of Claim:

16.3 Should OWNER or CONTRACTOR suffer injury or damage to person or property because of any error, omission or act of the other party or of any of the other party's employees or agents or others for whose acts the other party is legally liable, claim will be made in writing to the other party within a reasonable time of the first observance of such injury or damage. The provisions of this paragraph 16.3 shall not be construed as a substitute for or a waiver of the provisions of any applicable statute of limitations or repose.

Cumulative Remedies:

16.4 The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto, and, in particular but without limitation, the warranties, guarantees and obligations imposed upon CONTRACTOR by paragraphs 6.12, 6.16, 6.30, 6.31, 6.32, 13.1, 13.12, 13.14, 14.3 and 15.2 and all of the rights and remedies available to OWNER and ENGINEER thereunder, are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee or by other provisions of the Contract Documents, and the provisions of this paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right and remedy to which they apply.

Professional Fees and Court Costs Included:

16.5 Whenever reference is made to "claims, costs, losses and damages," it shall include in each case, but not be limited to, all fees and charges of engineers, architects, attorneys and other professionals and all court or arbitration or other dispute resolution costs.

Interest:

16.6 In the event that any payment of interest is to be made pursuant to any provision of the Contract Documents, excluding any bid bond, labor and materials bond or performance bond entered into by the CONTRACTOR, interest shall be paid at the average rate earned by the City of Louisville on its invested funds during the quarterly fiscal period prior to the period during which the interest was accrued.

Third Parties:

16.7 The contract is not intended to create any right in or for the public or any member thereof, any subcontractor or supplier, or any other third party, or to authorize anyone not a party to the contract to maintain a suit to enforce its terms. The duties, obligations, and responsibilities of the parties to the contract, with respect to third parties, shall remain as imposed by law. This paragraph shall not apply to any surety to the extent it is acting under any labor and materials bond or performance bond entered into by the CONTRACTOR.

Severability:

16.8 To the extent that the performance of the parties' obligations may be accomplished within the intent of the contract, the terms of the contract are severable, and should any term or provision of the contract be declared invalid or become inoperative for any reason, such invalidity or failure shall not affect the validity of any other contract term or provision.

Equal Opportunity Employer:

16.9 The CONTRACTOR will not discriminate against any employee or applicant for employment because of race, color, religion, age, sex, disability or national origin. The CONTRACTOR will take affirmative action to ensure that applicants are employed and that employees are treated during employment without regard for their race, color, religion, age, sex, disability or national origin. Such action shall include but not be limited to the following: employment, upgrading, demotion or transfer, recruitment or recruitment advertising, layoff or termination, rates of pay or other forms of compensation, and selection for training, including apprenticeship. The CONTRACTOR agrees to post in conspicuous places, available to employees and applicants for employment, notice to be provided by an agency of the federal government, setting forth the provisions of the Equal Opportunity Laws.

The CONTRACTOR shall be in compliance with the appropriate areas of the Americans with Disabilities Act of 1990 as enacted and from time to time amended and any other applicable federal regulation. A signed, written certificate stating compliance with the Americans with Disabilities Act may be requested at any time during the life of any contract and with any contract entered by the OWNER.

SECTION 01010

SUMMARY OF WORK

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Work covered by contract documents

B. Work by others

C. Contractor use of site and premises

D. Work sequence

E. Protection of public and private property

F. Regulatory requirements

G. Cutting and patching

1.2 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work will include all necessary labor, supervision, equipment, tools and materials for the installation of two Chlorine Dioxide generation and feed systems. Work includes, but is not limited to, installation of the two generators including, piping, solution pump, water booster pump, control panel, valves and appurtenances, and ancillary piping and devices for complete functional systems.

B. Contractor shall furnish and pay for all materials, equipment, supplies, appurtenances; provide all construction equipment and tools; and perform all necessary labor and supervision

C. Contractor shall coordinate the progress of the Work including coordination between trades, subcontractors, suppliers, public utilities and Owner to insure the progress of Work

D. It is the intent of this contract that Work proceed in the most expeditious manner possible

E. Construct the Work under contract indicated in the Bid Form

F. The cross-referencing of specification sections under the heading "Related Sections" and elsewhere within each specification section is intended as an aid to the Contractor and shall not relieve the Contractor from his responsibility to coordinate the Work under the Contract Documents. Listings of cross-references are not intended to be comprehensive. The omission of a cross-reference to an additional or related requirement shall not relieve the Contractor of his obligation to provide a complete Project.

1.3 WORK BY OTHERS

A. Construct work to allow for work by others. Coordinate construction schedule with the Owner.

1.4 CONTRACTOR USE OF SITE AND PREMISES

A. Contractor shall limit use of the premises for Work and will use designated staging areas indicated by the Owner for equipment and material storage.

B. Coordinate use of premises under direction of Engineer and/or Owner

C. Assume full responsibility for the protection and safekeeping of equipment and products stored on site under this Contract

D. Contractor should plan for normal workdays, Monday through Friday, within the hours of 7:00 am to 7:00 pm, except for Holidays that are recognized by the City. Other work hours and days may be allowed by City and Engineer upon 48 hours written notice

1.5 OWNER USE OF SITE AND PREMISES

A. Owner shall coordinate with Contractor the entrance into work site for work performed under the Contract Documents to ensure Contractor's health and safety plans are followed

B. Existing facility to remain operational during construction. All access maintained.

1.6 WORK SEQUENCE AND WORK RESTRICTIONS

A. Construct work to allow for work by others. Coordinate construction schedule with the Owner.

B. Contractor shall submit a detailed CPM format schedule outlining all steps required to assure complete and satisfactory construction, testing, and startup of work in such a manner as to result in the least possible disruption to the operations and staff of the treatment facility and to allow the facility to achieve the finished water quality requirements established by regulations at all times. Address all work sequence and constraints described in this Section.

C. Conduct work in a manner that will not impair the operational capabilities of essential elements of the existing water treatment process.

D. Indicate required shutdowns of existing facilities or interruptions of existing operations on Progress Schedule. Shutdowns will be permitted to the extent that existing operation of the plant will not be jeopardized and identified constraints are satisfied.

E. Construct work in stages to minimize water service outages. Coordinate construction schedule and water main shutdowns with Engineer and Owner.

1.7 PROTECTION OF PUBLIC AND PRIVATE PROPERTY

A. Protect, shore, brace, support, and maintain underground conduits, drains, and other underground construction uncovered or otherwise affected by construction operations

B. Contractor shall be responsible for all damage to streets, roads, highways, shoulders, street lighting and/or signage, embankments, culverts, location or character, which may be caused by transporting equipment, materials, or personnel to or from the Work or any part or site thereof, whether by him or his subcontractors

C. Make satisfactory and acceptable arrangements with the Owner of, or the agency or authority having jurisdiction over, any damaged property concerning its repair or replacement or payment of costs incurred in connection with the damage

1.8 PROTECTION OF WORK AND FACILITIES

A. Contractor shall be solely responsible for the protection of Work until final acceptance

B. Contractor shall protect all and any previously performed Work, work in progress or completed by others, and existing facilities from damage during the performance of Work in the area

1.9 REGULATORY REQUIREMENTS

A. Comply with all federal, state, and local laws, regulations, codes, and ordinances applicable to the Work

B. References in the Contract Document to local codes shall mean the codes in effect in the City of Louisville.

C. Other standards and codes which apply to the Work are designated in the specific technical specifications

1.10 CUTTING AND PATCHING

A. Contractor shall be responsible for all cutting, and patching, including attendant excavation and backfill, required to complete the Work or to
   1. Uncover portions of the Work to provide for installation of ill-timed work
   2. Remove and replace defective work
   3. Remove and replace work not conforming to requirements of Contract Documents
   4. Remove samples of installed work as specified for testing

B. Provide products as specified or as required to complete cutting and patching operations

C. Inspection
   1. Inspect existing conditions of the Project, including elements subject to damage or to movement during cutting and patching

2. After uncovering work, inspect the conditions affecting the installation of products, or performance of the work
3. Report unsatisfactory or questionable conditions to the Engineer in writing; do not proceed with the work until the Engineer has provided further instructions

D. Preparation
1. Provide devices and methods to protect other portions of the Project from damage
2. Provide protection from the elements for that portion of the Project which may be exposed by cutting and patching work, and maintain excavations free from water
3. Execute fitting and adjustment of products to provide a finished installation to comply with specified products, functions, tolerances and finishes
4. Restore work which has been cut or removed; install new products to provide completed Work in accord with requirements of Contract Documents

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 01039

COORDINATION AND MEETINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. General requirements

B. Coordination

C. Field engineering

D. Alteration project procedures

E. Preconstruction conference

F. Progress meetings

G. Requests for information

1.2 RELATED SECTIONS

A. Section 01010 – Summary of Work

B. Section 01340 – Shop Drawings and Product Data

C. Section 01700 – Contract Closeout

1.3 GENERAL REQUIREMENTS

A. Refer to General Conditions for Owner meetings and other requirements

B. Engineer will schedule and administer pre-construction meeting according to agenda
   1. Prepare agenda for meetings including items required by Owner and Contractor
   2. Notify Contractor and Owner 4 days in advance of meeting date
   3. Preside at meeting

C. Contractor will schedule and administer site mobilization and weekly progress meetings. Contractor will also be responsible for coordination, field engineering, alteration, project procedures, cutting and patching procedures outlined herein. If work progress does not warrant a meeting, all parties can mutually agree to postpone meeting.
   1. Arrange for the attendance of Contractor's agents, employees, subcontractors, and suppliers as appropriate to the agenda
   2. Record the minutes; include all significant proceedings and decisions
   3. Reproduce and distribute copies of minutes within one week after each meeting
      a. To all participants in the meetings

b. To Engineer
c. To Owner

4. Owner and other inspecting parties such as the geotechnical engineer/technician as well as plant operators may attend meetings
5. Engineer will attend weekly meetings either via phone or on site

D. Representatives of contractors, subcontractors, and suppliers attending the meetings shall be qualified and authorized to act on behalf of the entity each represents

1.4 COORDINATION

A. Coordinate scheduling, submittals, and Work of the various Sections of specifications to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later by others.

B. Verify that utility requirement characteristics of operating equipment are compatible with available utilities. Coordinate work of various Sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment, and coordinate preparation of grading and other requirements for installation utility work by others.

C. Coordinate completion and clean-up of Work of separate Sections in preparation for final completion and for portions of Work designated for Owner’s use

D. After Owner occupancy of premises, coordinate access to site for correction of defective Work and Work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

1.5 FIELD ENGINEERING

A. Employ a Land Surveyor registered in the State of Colorado and acceptable to the Engineer and Owner.

B. Contractor will locate and protect survey control and reference points.

C. Control datum for survey is that established by Owner provided survey and shown on Drawings.

D. Provide field engineering services. Establish elevations, lines, and levels, utilizing recognized engineering survey practices.

1.6 ALTERATION PROJECT PROCEDURES

A. Materials: As specified in product Sections; match existing products and work for patching and extending work.

B. Where new work abuts or aligns with existing, perform a smooth and even transition. Patched work to match existing adjacent work in texture and appearance.

C. When finished surfaces are cut so that a smooth transition with new work is not possible, terminate existing surface along a straight line at a natural line of division and make recommendation to Engineer.

D. Where a change of plane of 1/4-inch or more occurs, submit recommendation for providing a smooth transition for Engineer review.

E. Patch or replace portions of existing surfaces, which are damaged, lifted, or showing other imperfections.

F. Finish surfaces as specified in individual product sections.

1.7 PRECONSTRUCTION CONFERENCE

A. Engineer will schedule a conference after Notice of Award

B. Location: On site

C. Attendance
1. Owner's Representative
2. Engineer and his professional consultants
3. Geotechnical Engineer
4. Contractor's Project Manager
5. Contractor's Superintendent
6. Major Subcontractors
7. Others as Appropriate

D. Agenda:
1. Execution of Owner Contractor Agreement.
2. Submission of executed bonds and insurance certificates.
3. Distribution of Contract Documents.
4. Submission of list of subcontractors and suppliers, list of products, Schedule of Values, and Construction Project Schedule in critical path format.
5. Designation of personnel representing the parties in Contractor, Owner, and the Engineer.
6. Procedures and processing of field decisions, submittals, substitutions, applications for payments, cost proposal requests, Change Orders and Contract closeout procedures.
7. Construction scheduling and updates.
8. Scheduling activities of Geotechnical Engineer, equipment manufacturers representatives, and other field tests
9. Critical work sequencing
10. Major equipment deliveries and priorities
11. Procedures for maintaining Record Documents
12. Construction facilities, controls and construction aids
13. Temporary utilities provided by Owner
14. Safety and first-aid procedures
15. Security and housekeeping procedures

16. Procedures for testing

1.8 PROGRESS MEETINGS

A. Contractor will schedule and administer meetings throughout progress of the Work at weekly intervals. If work progress does not warrant meeting, all parties can mutually agree to postpone the weekly meeting.

B. Location of the Meetings: The project field office of the Contractor, or other locations arranged for by Contractor, convenient to all parties

C. Contractor will make arrangements for meetings, prepare agenda with copies for participants, preside at meetings, record minutes, and distribute copies within one week to Contractor, Owner, participants, and those affected by decisions made.

D. Attendance
1. Owner's Representative
2. Engineer, and his professional consultants as needed
3. Contractor's Superintendent
4. Subcontractors as appropriate to the agenda
5. Suppliers as appropriate to the agenda
6. Others, as appropriate

E. Suggested Agenda
1. Review Minutes of Previous meetings
2. Review Unresolved issues from Last Meeting
3. Review of Work Progress
4. Field Observations, Problems, Conflicts and Decisions
5. RFI Review
6. Review of Submittals Schedule and Status of Submittals
7. Schedule
    a. General Schedule Issues
    b. Review of off-site fabrication and delivery schedules
    c. Planned progress during succeeding work period (3-week “Look ahead”)
    d. Maintenance of construction project schedule
    e. Corrective measures to regain project schedules
8. Maintenance of Quality and Work Standards
9. Change Orders
10. New PR’s
11. Accepted Change Orders
12. Pay Requests
13. Other Business

1.9 REQUESTS FOR INFORMATION (RFI)

A. The Contractor shall prepare and submit an RFI upon the discovery of the need for interpretation of the Contract Documents or additional information.
1. Only the Contractor shall submit RFIs to the Engineer.

2. RFIs shall be submitted on Engineer's RFI form. Engineer will provide a template for the Contractor upon request.

B. RFI shall include:
   1. Project Name
   2. Engineer Job Number
   3. Date
   4. Name of Contractor
   5. Name of Engineer
   6. RFI number, numbered sequentially
   7. Related specification section number, title, and related paragraphs, as needed
   8. Drawing number and detail references, as needed
   9. Field conditions
   10. Contractor's proposed solution. If the Contractor's solution(s) affect contract times or contract price, Contractor shall state the effects on the RFI.
   11. Contractor's signature
   12. Relevant attachments including but not limited to drawings, descriptions, measurements, photos, product data, and shop drawings

C. Electronically Submitted RFIs
   1. Contractor shall submit one (1) complete RFI file in Adobe Acrobat PDF format

D. Engineer's Response
   1. Engineer will review each RFI, determine action required, and respond.
   2. Engineer will review and respond to each RFI within seven (7) working days
   3. If Engineer receives an RFI after 1:00 P.M. local time, the RFI will be considered as received the following working day.
   4. Engineer will not respond to RFIs requesting approval of submittals, approval of substitutions, coordination and information already indicated in Contract Documents, adjustment in contract time or contract amount, or erroneous RFIs.
   5. Engineer may respond to RFIs on related issues with a single response.
   6. If Engineer requests additional information as a result of the RFI, any further action or RFIs submitted by the Contractor will restart a new seven (7) day review period.
   7. Contractor shall submit any request for change of contract time or contract price utilizing proper Change Order forms.

E. Contractor shall log and track all RFIs submitted organized by RFI number.
   1. RFI log shall be submitted at each progress meeting
   2. RFI log shall include:
      a. Project name
      b. Name, address, and phone number of Contractor
      c. Contractor representative name
      d. RFI number
      e. RFI description
      f. RFI submittal date
      g. RFI response date
      h. Related Change Order number, as needed

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 01080

IDENTIFICATION SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Color coding, lettering, and tagging of all new exposed pipe and electrical equipment

1.2 RELATED SECTIONS

A. Section 09900 – Coatings

1.3 REFERENCES

A. ANSI 13.1 – Scheme for the Identification of Piping Systems

PART 2 PRODUCTS

2.1 MATERIALS

A. Coatings: As specified in Section 09900

B. Nameplates: Plastic, two colors for surface and core

PART 3 EXECUTION

3.1 LOCATION OF IDENTIFICATION

A. Lettering and flow direction arrows
   1. Near equipment served
   2. Close to valve or flanges
   3. Adjacent to branches, tees and changes in direction of pipeline
   4. At intervals of not more than 20 feet on straight runs, unless otherwise indicated by Engineer

3.2 LETTERING

A. Lettering to be provided by:
   1. Paint, stencil
   2. Cylindrically coiled printed plastic sheets meeting ANSI A13.1-2007
      a. Seton, Setmark Pipe Markers
      b. Or accepted equal

B. Letter size as follows:

Outside Diameter of Pipe Or Covering (inch)	Minimum Height of Letters (inch)
¾ Through 4	¾
>4 to <8	1 1/4
8 or larger	2 1/2

3.3 NAME PLATES

A. Provide nameplates on all electrically powered equipment and electrical enclosures
   1. Size: Approximately 3-inch wide by 2-inch high, on red plastic surface engraved through to a yellow core
   2. Label: “Danger” in capital ½ inch letters on top line. The balance of sign in 3/8-inch capital letters reading: “Do not perform any equipment maintenance until main power disconnect is turned off and padlocked”
   3. Provide additional electrical nameplates of the size and colors indicated in the individual specification sections
   4. Install in prominent location agreed to by the Engineer and Owner

B. Provide nameplate at all non-potable water outlets
   1. Size: approximately 3-inch wide by 2-inch high, on red plastic surface engraved through to a white core
   2. Label: “Non-Potable Water” top line and “Do Not Drink” second line in ½ inch capital letters
   3. Securely attach to wall (if possible) or attach with stainless steel chain

3.4 SCHEDULED COLOR CODING

A. All 24-inch pipe and smaller

B. Bands where scheduled: 6-inch-wide, at 5-foot intervals

C. Provide only bands of color on un-insulated steel and PVC, elsewhere natural finish

3.5 PIPING NOT SCHEDULED

A. Paint to match wall or ceiling, unless otherwise directed by Engineer

B. Appropriately identify and place arrows

C. Un-insulated stainless steel and PVC
   1. Natural finish

3.6 SCHEDULE

A. Paint and letter colors

Piping Description	Pipe Base/Band Color	Color of Letters	Legend
Potable Water	Dark Blue	While	Potable Water
Sodium Chlorite Solution	Banding – no paint	White	Sodium Chlorite Solution
Chlorine Dioxide Solution	Banding – no paint	White	Sodium Chlorite Solution

B. For piping not specified above refer to “Ten State Standards-Water Works, 2012 Edition” and/or the CDPHE “Design Criteria for Potable Water Systems, September 2013” as well as consult with Engineer

C. Specifically paint the following items:
   1. Valve hand-wheels and levers: Red
   2. Hoist Hooks, blocks, monorail beams: Match existing

END OF SECTION

SECTION 01200

PAYMENT PROCEDURES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and other Division 1 Specification Sections, apply to this Section.

B. This information is supplemental to the requirements as stated in the General Conditions.

1.2 SUMMARY

A. This Section includes additional administrative and procedural requirements necessary to prepare and process Applications for Payment. Refer to General Conditions for most requirements of the Owner.
   1. Unit Prices for administrative requirements governing use of unit prices
   2. Construction Progress Schedules

1.3 DEFINITIONS

A. Unit Price: An amount proposed by bidders, stated on the Bid Form, as a price per unit of measurement for materials or services.

1.4 PROCEDURES FOR UNIT PRICES

A. Unit bid prices, as quoted in the Bid Form, shall be in full compensation for labor, materials, equipment, rentals, freight, applicable taxes, overhead, profit and incidentals to complete all work for each pay item; and for all risk, loss, damage, or expense of whatever nature arising from the nature of the work or the prosecution thereof.

B. Work or materials that are essential to the work, but for which there are no pay items, will not be measured and paid for separately, but shall be included in other items of work.

C. Prices include all necessary material, for a complete installation, insurance, applicable taxes, overhead, and profit
   1. Bid Item No. 1: Howard Berry Chlorine Dioxide Feed System Replacement
      Description: No separate measurement for payment will be made for any labor, equipment, and materials required for this item. This bid item includes but is not limited to the following in accordance with the Drawings and Specifications or as otherwise directed by Engineer: protecting all existing items, materials, and surfaces not to be demolished; demolishing, hauling, and disposing of existing chlorine dioxide feed equipment as shown on the Drawings including existing De Nora generators; clean up; and providing all other related and necessary labor, equipment, and materials to complete the Work not covered by other items in this section.

a. Unit of Measurement: No measurement for payment will be made for this work. It shall be paid for at the Contract Lump Sum Price based upon the percentage completed and accepted of the work required by this bid item.

2. Bid Item No. 2: Sid Copeland Chlorine Dioxide Feed System Replacement Description: No separate measurement for payment will be made for any labor, equipment, and materials required for this item. This bid item includes but is not limited to the following in accordance with the Drawings and Specifications or as otherwise directed by Engineer: protecting all existing items, materials, and surfaces not to be demolished; demolishing, hauling, and disposing of existing chlorine dioxide feed equipment as shown on the Drawings including existing De Nora generators; clean up; and providing all other related and necessary labor, equipment, and materials to complete the Work not covered by other items in this section.
   a. Unit of Measurement: No measurement for payment will be made for this work. It shall be paid for at the Contract Lump Sum Price based upon the percentage completed and accepted of the work required by this bid item.

D. Measurement and Payment: Refer to bid form and 1.5 (A) of this Section for establishment of unit prices

E. Owner reserves the right to reject Contractor’s measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor.

1.5 APPLICATION FOR PAYMENTS

A. General
   1. Submit itemized payment request as required in General Conditions together with Schedule of Values and other submittals as specified herein
   2. Contractor shall not "project" work completed beyond the date of Application for Payment submittal for the purpose of payment request

B. Each Application for Payment shall be consistent with previous applications and payments as certified by the Engineer and paid for by the Owner.
   1. The initial Application for Payment, the Application for Payment at time of Substantial Completion, and the final Application for Payment involve additional requirements

C. Payment Application Times: Each progress payment date is as indicated in the Agreement. The period of construction Work covered by each Application for Payment is the period indicated in the Agreement

D. Application Preparation: Complete every entry on the form, including notarization and execution by person authorized to sign legal documents on behalf of the Owner. Incomplete applications will be returned without action.
   1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions have been made.

2. Include amounts of Change Orders issued prior to the last day of the construction period covered by the application

E. Transmittal
   1. Submit copy of each Application for Payment to the Engineer by means ensuring receipt within 24 hours
   2. Transmit each copy with a transmittal form listing attachments, and recording appropriate information related to the application in a manner acceptable to the Engineer

F. Initial Application for Payment
   1. Administrative actions and submittals that must precede or coincide with submittal of the first Application for Payment include the following:
      a. List of subcontractors
      b. List of principal suppliers and fabricators
      c. Schedule of Values
      d. Contractor's Construction Schedule (preliminary if not final)
      e. Schedule of principal products
      f. List of Contractor's staff assignments
      g. Copies of building permits
      h. Copies of authorizations and licenses from governing authorities for performance of the Work
      i. Certificates of insurance and insurance policies
      j. Performance and payment bonds, if required

G. Application for Payment at Substantial Completion
   1. Following issuance of the Certificate of Substantial Completion, submit an Application for Payment. This application shall reflect any Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of Work
      a. Administrative actions and submittals that shall precede or coincide with this application include:
         i) Occupancy permits and similar approvals
         ii) Warranties (guarantees) and maintenance agreements
         iii) Test/adjust/balance records
         iv) Maintenance instructions
         v) Meter readings
         vi) Start-up performance reports
         vii) Change-over information related to Owner's occupancy, use, operation and maintenance
         viii) Final cleaning
         ix) Application for reduction of retainage, and consent of surety
         x) Advice on shifting insurance coverages
      b. List of incomplete Work, recognized as exceptions to Engineer’s Certificate of Substantial Completion

H. Application for Final Payment

1. Prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Price, previous payments, and sum remaining due.
2. Application for Final Payment will not be considered until the following have been accomplished:
    a. Completion of Project closeout requirements
    b. Completion of items specified for completion after Substantial Completion
    c. Assurance that unsettled claims will be settled
    d. Assurance that Work not complete and accepted will be completed without undue delay
    e. Transmittal of required Project construction records to Owner
    f. Proof that taxes, fees and similar obligations have been paid
    g. Removal of temporary facilities and services
    h. Removal of surplus materials, rubbish and similar elements

1.6 PROCEDURES FOR THE CONSTRUCTION PROGRESS SCHEDULE

A. Coordination: coordinate preparation and updates of Contractor's Construction Schedule with the preparation of Schedule of Values.
    1. Correlate line items in the Construction Schedule with required project tasks, including the following:
        a. Mobilization/demobilization
        b. Permits and regulatory requirements
        c. Submittals
        d. Equipment
        e. O&M Manuals
        f. Work breakdown of major project work
        g. Major subcontractors work
        h. Startup and commissioning
        i. Training
        j. Substantial completion
        k. Final completion
        l. Milestones and operational shutdown requirements

B. Utilize the Critical Path Method (CPM) type construction schedule to establish preliminary progress schedule and track Work progress
    1. After acceptance by Engineer of preliminary Progress Schedule submitted per requirements of General Conditions, set preliminary Progress Schedule as the Construction Baseline Schedule
    2. Update and submit the construction progress schedule on a monthly basis with the pay application
        a. Monthly submittal should indicate progress of tasks, changes to baseline schedule logic, work additions such as change orders, milestone and contract date changes
        b. Submit two (2) color print copies, 11" x 17" size, and one Adobe pdf copy
        c. Upon request provide copy of project schedule CPM data file

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

A. Provide a list of unit prices as indicated in Division 0 Bid Form

END OF SECTION

SECTION 01340

SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Submission of all shop drawings and product data as required by the Contract Documents for all equipment and materials to be furnished under this contract unless specifically indicated otherwise

1.2 RELATED SECTIONS

A. Section 01600 – Materials and Equipment

B. Section 01730 – Operations and Maintenance Data

C. Specification Divisions 2 thru 16

1.3 SUBMITTALS

A. Definitions
   1. Technical submittals: Shop drawings, product data and samples prepared by Contractor, subcontractors, suppliers, or manufacturers
      a. Shall be submitted by the Contractor to Engineer for approval for the use of Equipment and Materials to complete the Work or as needed to describe the following:
         i) Operation and maintenance
         ii) Technical properties
         iii) Installation
      b. Shop drawings: Custom prepared data for the Project and Work including performance and capacity curves, diagrams, bills of material, instructions, and other information
      c. Product data: Non-custom prepared printed information for the Project and Work on materials and products
      d. Samples: Fabricated and non-fabricated tangible samples of products and material
         i) Used for visual inspection and testing and analysis
   2. Informational submittals: Reports, administrative informational submittals, certification and guarantees not including and defined as shop drawings, samples and product data
      a. Reports: Include laboratory reports and tests, technical procedures and records and design analysis
      b. Administrative informational submittals: Submittals necessary for administrative records such as construction photographs, work records, schedules, standards, record project data, safety data, and similar information submittals
      c. Certification: Includes manufacturer or supplier certificates and guarantees

B. General Requirements
   1. Quality
      a. Shall be of suitable quality for legibility and reproduction purposes
      b. Shall be useable for reproduction yielding legible hard copy
      c. Submittals not conforming to specified requirements herein and as specified in Divisions 2 through 16 shall be subject to rejection by Engineer and upon Engineer request, Contractor shall resubmit documents that are in conformance
   2. Dimensions
      a. English units shall be provided on submittals
      b. Metric units are acceptable in addition to English units
      c. English units shall govern
   3. Form of submittals
      a. Submittals shall be transmitted in electronic format as specified herein
      b. Scanned submittals are acceptable
      c. Electronic project documents and submittals shall be transmitted in the following format:
         i) Native electronic format, nonproprietary
         ii) Adobe PDF produced from native electronic format
      d. Filename:
         i) Shall be consistent for the initial and any subsequent submission revisions for a single submittal
         ii) Contractor shall use a consistent naming convention for all submittals
            a) Use number of original submittal followed directly by a capital letter corresponding to the number of times a submittal is resubmitted (i.e., #001, #001A, #001B, etc.)
   4. Non-conforming submittals shall be subject to rejection by Owner and/or Engineer
   5. Submittal completion requirements
      a. Submittals shall include design criteria, dimensions, construction materials and all other information specified for a complete submittal to facilitate Engineer review of the submittal information adequately
      b. In the event various drawings are included a submittal for a class of Equipment, Contractor shall annotate clearly which parts apply to furnished Equipment
         i) Information not pertaining to the submittal shall be clearly annotated. Highlighting of such information will cause rejection of the submittal by the Engineer
      c. Contract Drawings
         i) Copies or portions thereof will not be allowed as acceptable fabrication or erection drawings
         ii) In the event Contract Drawings are used by the Engineer for erection drawings to annotate information on erection or identify reference details, Engineer title block and professional seal shall be removed and replaced with the Contractor's title block on the Contract Drawing(s). Contractor shall revise such erection drawings for subsequent revisions by the Engineer to Contract Drawings

C. Preparation
   1. Shop Drawings

a. Drawings shall be presented in a clear and thorough manner:
b. Identify details by reference to sheet and detail, schedule or room numbers shown on Contract Drawings
c. Identify equipment by reference to equipment name and tag number shown on Contract Drawings
d. Scale and Measurements: Make drawings accurate to a scale with sufficient detail to show the kind, size, arrangement and function of component materials and devices
e. Minimum sheet size: 8.5" by 11"
f. Fabrication drawing size: 11" by 17"

2. Product Data
   a. Clearly mark each copy to identify pertinent products or models submitted for review
   b. Identify equipment by reference to equipment name and P&ID number
   c. Catalog cut sheets: Cross-out or hatch irrelevant data

D. Technical Submittals: Shop Drawings and Product Data Submittal Requirements
   1. Shop Drawings and Product Data shall include the following, at a minimum:
      a. Specifications of manufacturer(s)
      b. Equipment parts and catalogs
      c. Bills of materials, material lists, and schedules
      d. Shop erection and fabrication drawings
      e. Drawings shall include equipment dimensions, weights, installation location requirements, plates required, main components, support details, anchor bolt details/sizes/locations, support base sizes, baseplate sizes, spacing and clearance requirements for installation, erection, operation and maintenance disassembly
      f. Electrical requirements:
         i) Shall include schematic diagrams including one-line diagrams, terminal block numbers, internal wiring diagrams, external connections, controls, and any other information as requested in individual specification sections
      g. List of spare parts
      h. Instruction and Operation and Maintenance (O&M) manuals
         i) As specified herein and in Specification Section 01730
      i. Manufacturer’s performance testing of equipment
      j. Concrete mix design data and information
      k. Performance characteristics and capacities
      l. External connections, anchorages, and supports required
      m. Other drawings, parts, catalogs, specifications, samples, or data necessary for the Engineer to determine conformance with Contract Documents
   2. Samples – Office samples shall be of sufficient size and quantity to clearly illustrate:
      a. Functional characteristics of the product, with integrally related parts and attachment devices
      b. Full range of color, texture and pattern
      c. Comply with requirements identified in individual specification sections

E. Construction Schedule: Designate in the construction schedule, or in a separate coordinated shop drawing schedule, the dates for submission and the dates that reviewed Shop Drawings and Product Data will be needed, if accelerated review is requested

F. Field samples and Mock-ups:
   1. Contractor shall erect, at the Project Site, at a location acceptable to the Engineer and Owner
   2. Size or area: as specified in the respective specification section
   3. Fabricate each sample and mock-up complete and finished
   4. Remove mock-ups at conclusion of Work or when acceptable to Engineer

1.4 CONTRACTOR RESPONSIBILITIES

A. Review shop drawings and product data prior to submission for accuracy and completeness of each submission

B. Approve and stamp each submission before submitting to Engineer

C. Determine and verify:
   1. Field measurements
   2. Field construction criteria
   3. Catalog numbers and similar data
   4. Conformance with specifications and identification of all deviations
   5. Confirm assignment of unit responsibility

D. Prior to each submission, carefully review and coordinate all aspects of each item being submitted

E. Verify that each item and the corresponding submittal conform in all respects with specified requirements of the Work and of the Contract Documents with respect to means, methods, techniques, sequences, and operations of construction, and safety precautions and programs incidental thereto

F. Make submissions promptly in accordance with Construction Schedule, and in such sequence as to cause no delay in the Work or in the work of any other Contractor

G. Submittal review period shall be less than 14 calendar days

H. Notify Engineer in writing, at time of submission, of any deviations in the submittals from Contract Document requirements:
   1. Identify and tabulate all deviations in transmittal letter
   2. Indicate essential details of all changes proposed, including modifications to other facilities that may be a result of the deviation
   3. Include required piping and wiring diagrams

1.5 SUBMISSION REQUIREMENTS

A. Make submissions far enough in advance of scheduled dates for installation to provide time required for reviews, for securing necessary approvals, for possible revisions and resubmissions, and for placing orders and securing delivery

B. In scheduling, allow fourteen (14) calendar days for review by Engineer following receipt of submission in Engineer's office:
   1. Time required to mail submissions or resubmissions is not considered a part of review period

C. Submittal Naming and Numbering
   1. Assign a unique number to include all shop drawings, product data and other information required for individual specification sections, beginning with #001.
   2. Resubmissions shall have the original number with a letter, starting with "A". If the first submittal required resubmission, it would be labeled #001A.
   3. Each specification section may still have more than one submittal number for later submissions (i.e., Preliminary O&M Manuals, Final O&M Manuals, etc.)
   4. Contractor shall use a consistent naming convention for all submittals

D. Quantity of Submittals Required
   1. Shop Drawings and Product Data:
      a. Initial submittal:
         i) Electronic – One (1) copy to Engineer
      b. Resubmittal:
         i) Electronic – One (1) copy to Engineer
      c. Final Submittal for Distribution
         i) Paper hard copy - Maximum of two (2) copies for Contractor's use, plus a maximum of three (3) copies which will be distributed by Engineer when approved. Do not submit more than five (5) copies
         ii) One (1) electronic copy to Engineer
      d. As –constructed document submittals
         i) Paper hard copy – Maximum of two (2) copies for Contractor's use, plus a maximum of three (3) copies which will be distributed by Engineer when approved. Do not submit more than five (5) copies
         ii) Electronic – One (1) copy to Engineer and one (1) copy to Owner
   2. Samples
      a. Initial submittal:
         i) Submit three (3) of each sample unless specified otherwise in individual specification section
      b. Resubmittal:
         i) Submit three (3) to Engineer
      c. One (1) sample of approved sample submittal will be returned to Contractor
   3. Informational submittals
      a. Technical reports and administrative submittals
         i) Electronic – One (1) copy to Engineer
         ii) Paper: Three (3) copies to Engineer
      b. Certificates and guarantees:

i) Electronic – One (1) copy to Engineer
ii) Paper: Three (3) copies to Engineer

c. Test reports
i) Paper
a) Owner: Two (2) copies
b) Engineer: One (1) copy
c) Contractor: Two (2) copies
d) Manufacturer/supplier: One (1) copy

4. Instruction and O&M manuals
a. In accordance to Specification Section 01730
5. At no additional cost to the Owner and whether or not submittals are copyrighted, the Owner may copy and use for staff training and/or internal operations any submittals approved for final distribution as well as required by this Contract

E. Submittal Transmittal Requirements
1. Accompany each submittal with a letter of transmittal showing all information required for identification and checking
2. Shall include:
a. Drawing numbers and titles
b. Revision number
c. Electronic filename
d. Deviations from Contract Documents: As specified herein
e. Submittals unidentifiable will be returned for proper identification
f. Date

F. Submittals Requirements
1. Submittal number
2. Date of submission and dates of any previous submissions
3. Project title and number
4. Owner Contract identification number if applicable
5. Names of:
a. Contractor
b. Supplier
c. Manufacturer
6. Identification of the product, with the specification section number
7. Field dimensions, clearly identified as such
8. Relation to adjacent or critical features of the Work or materials
9. Applicable standards, such as ASTM or Federal Specification numbers
10. Identification of deviations from Contract Documents:
a. If Contractor proposes to provide material or equipment of Work which deviates from the Project Manual, Contractor shall indicate so under “deviations” on the transmittal form accompanying the submittal copies
b. Identify all requested deviations as specified and on the copies of Specifications and Drawings required by paragraph below.
11. Confirmation of compliance with Contract Documents and, if applicable, identification of deviations from Contract Documents:

a. Provide the following documents to demonstrate compliance with the contract specifications:
    i) A copy of the relevant Drawing(s) with all addendum updates that apply to the equipment in various Divisions marked to show specific changes necessary for the equipment proposed in the Contractor's submittal
        a) If no changes are required, the Drawing(s) shall be clearly marked "No Changes Required"
        b) Failure to include copies of relevant Drawing(s) with the submittal, whether changes are required or not, shall be cause for rejection of the entire submittal with no further review by Engineer
        c) Relevant Drawing(s) include as a minimum the control diagrams, process and instrumentation diagrams (P&IDs), and Process (P) drawings.
    ii) A copy of each pertinent specification section with all addendum updates included, all referenced and applicable specifications sections, with their respective addendum updates included, with each paragraph check-marked to indicate specification compliance or marked to indicate the requested deviations from the specification requirements:
        a) If deviations from the specifications are indicated and, therefore requested, by the Contractor, the submittal shall be accompanied by a detailed, written justification for each deviation
        b) Failure to include a copy of the marked up specification sections, along with justification for any requested deviations to the specification requirements, with the submittal shall be cause for rejection of the entire submittal with no further review by Engineer

12. Identification of revisions on resubmissions
13. An 8" by 4" blank space for Contractor's and Engineer's stamps
14. Stamp cover sheet of each submittal as identified in letter of transmittal
15. Contractor's stamp: Initialed or signed, certifying review and approval of submittal, verification of products, field measurements and field construction criteria, and coordination of the information within the submittal with requirements of the Work and of Contract Documents. Use stamp to include wording similar to the following:

> This submittal has been reviewed by [*Name of Contractor*] and approved with respect to the means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incidental thereto. [*Name of Contractor*] also warrants that this submittal complies with contract documents and comprises no deviations thereto:
> Section No:___ Submittal No:
> Date:_____ By:

G. For equipment that is provided directly by manufacturer without specification provide:
    1. Shop drawings: Illustrate complete assembly of products; foundation, installation and anchor requirements; dimensions and total weights of each, electrical wiring diagrams

2. Product data: Provide manufacturer’s literature including general assembly, materials of construction, model and type, detailed data describing parts and accessories, sufficient data to verify compliance with specifications
3. Manufacturer’s installation instructions: Provide detailed connection requirements and startup instructions
4. Manufacturer’s field report: Indicate personnel present and actual start-up procedures that were performed by manufacturer’s representative
5. Field report and test results shall be submitted to the Engineer by the Contractor

H. Submittal Log:
1. Maintain an accurate submittal log for duration of the Work showing current status of all submissions
2. Show submittal number, section number, section title, submittal description, dates and disposition of submittal
3. Make submittal log available to Engineer for Engineer's review upon request

I. Unless specified otherwise, make submissions in groups to facilitate efficient review and approval:
1. Include all associated items from individual specification sections to assure that all information is available for checking each item when it is received
2. Submit a complete initial submittal including all components when an item consists of components from several sources
3. Partial submittals may be rejected as not complying with provisions of the Contract
4. Engineer will not be held liable for delays due to poorly organized or incomplete submissions
5. Do not include items from more than one specification section for any one submittal number

J. Contractor may require subcontractors to provide drawings, setting diagrams and similar information to help coordinate the Work, but such data shall remain between Contractor and his subcontractors and will not be reviewed by Engineer unless specifically called for within the Contract Documents

K. All submittals for each component of multi-component systems shall be compiled and submitted through the Contractor to the Engineer by the manufacturer having System Responsibility

1.6 DISPOSITION OF SHOP DRAWINGS, PRODUCT DATA, AND INFORMATION SUBMITTALS

A. "No Exceptions Taken": Approved with No Corrections Noted
1. One copy sent to Owner
2. One copy sent to Resident Project Representative
3. One copy retained in Engineer's file
4. Remaining copies returned to Contractor for his use
   a. One copy to be kept on file at Contractor's office at job site
   b. Remaining copies for Contractor's office file, suppliers, or subcontractors

5. No corrections or comments noted on the submittal or on a Submittal Response Summary Sheet
6. Issues or miscellaneous comments pertaining to other related items of the Work may be included in transmittal letter
7. Resubmission not required

B. "Exceptions Noted": Approved with Corrections Noted
1. One copy sent to Owner
2. One copy sent to Resident Project Representative
3. One copy retained in Engineer's file
4. Remaining copies returned to Contractor for his use
    a. One copy to be kept on file at Contractor's office at job site
    b. Remaining copies for Contractor's office file, suppliers or subcontractors
    c. Copies of submittal data in operation and maintenance manuals to be revised according to corrections
5. Comply with corrections or comments as noted on the submittal or on a Submittal Response Summary Sheet
6. Resubmission not required

C. "Revise And Resubmit": Incorrect information provided or Significant Information Still Required
1. One copy sent to Resident Project Representative
2. One copy retained in Engineer's file
3. All remaining copies returned to Contractor for revision and re-submittal
4. Copy of transmittal letter and/or Submittal Response Summary Sheet sent to Owner. A "No Exceptions Taken" or "Exceptions Noted" submittal it will be forwarded to Owner after review per above disposition requirements
5. Submittal is either: incorrectly annotated; specific comments need to be addressed and incorporated in re-submittal; and/or additional information may be required as noted on the submittal or on a Submittal Response Summary Sheet
6. Submitted information may not include or address specific item required per the specification as identified on the submittal or on a Submittal Response Summary Sheet
7. Specific information related to identified item may be required for final approval of submittal
8. Resubmission of entire submittal may be required or resubmission of specific item may be required as identified on the submittal or on a Submittal Response Summary Sheet

D. "Rejected": Returned for Correction
1. One copy sent to Resident Project Representative
2. One copy retained in Engineer's file
3. All remaining copies returned to Contractor
4. Copy of transmittal letter and/or Submittal Response sent to Owner
5. Contractor required to resubmit complete submittal package in accordance with Contract Documents
6. Submittal does not comply with provisions of Contract Documents as noted on the submittal or on a Submittal Response Summary Sheet

7. Resubmission required

E. “Receipt Acknowledged”: For Reference Purposes Only, or for Record Copy:
   1. Applicable to manufacturer or Contractor provided calculations and other miscellaneous documentation no subject to Engineer review and approval
   2. One copy sent to Resident Project Representative
   3. One copy retained in Engineer's file
   4. One copy returned to Contractor
   5. Copy of transmittal letter sent to Owner
   6. Remaining submittal copies destroyed
   7. Detailed review and comment by Engineer not required
   8. Resubmission not required

1.7 DISPOSITION OF SAMPLES

A. "No Exceptions Taken": Approved with No Corrections Noted
   1. One sample sent to Owner
   2. One sample sent to Resident Project Representative
   3. One sample retained in Engineer's file
   4. Acknowledgement: Copy of transmittal letter sent to Contractor
   5. Resubmission not required

B. "Exceptions Noted": Approved with Corrections Noted
   1. One sample sent to Owner
   2. One sample sent to Resident Project Representative
   3. One sample retained in Engineer's file
   4. Acknowledgement: Copy of transmittal letter sent to Contractor
   5. Work performed or products furnished to comply with exceptions noted in acknowledgement
   6. Resubmission not required

C. "Rejected": Returned for Correction
   1. One sample retained in Engineer's file
   2. Remaining samples sent to Contractor for resubmittal and compliance with the Contract Documents as noted in transmittal letter
   3. Copy of transmittal letter sent to Owner
   4. Resubmission required

1.8 RESUBMISSION REQUIREMENTS

A. Make any corrections or changes in submittals required by Engineer and resubmit until approved

B. Transmit each resubmission under new letter of transmittal. Use number of original submittal followed directly by a capital letter corresponding to the number of times a submittal is resubmitted (i.e., #001, #001A, #001B, etc.)

C. Shop Drawings and Product Data

1. Revise initial drawings or data and resubmit as specified for the initial submittal
2. Indicate any changes which have been made other than those requested by Engineer

D. Samples: Submit new samples as required for initial submittal

E. Reimbursement of Resubmission Review Costs:
1. Review of first submittal and one resubmittal will be performed by Engineer at no cost to Contractor
2. Cost for review of subsequent resubmissions will be directly paid by Contractor
3. Engineer will document work-hours required for review and costs for Engineer review will be deducted from payments due Contractor as Change Order deducts
4. Charges for review of resubmissions will include Engineer at maximum rate of $150 per hour and administrative staff at maximum rate of $75 per hour

1.9 PROJECT RECORD SUBMITTALS

A. After completion of the Work and prior to final payment, Contractor shall furnish record documents and final approved shop drawings and samples (as-constructed shop drawings and samples) in the number of copies specified herein.
1. Contractor shall provide additional copies of final approved shop drawings and samples for insertion in Equipment instruction and O&M manuals as required
2. All copies shall be clearly marked “Project Record”

1.10 ENGINEER'S DUTIES

A. Review submittals with reasonable promptness and in accordance with approved submission schedule provided that each submittal has been called for by the Contract Documents and is stamped by Contractor as indicated above
1. No extensions of time are allowed due to Engineer’s delay in reviewing submittals unless all the following criteria are met:
a. Contractor has notified Engineer in writing that timely review of particular submittal in question is critical to the progress of the Work and Contractor has identified the requested submittal return date.
b. Engineer has failed to return submittal within 21 days of receipt of the submittal or receipt of said notice, whichever is later
c. Contractor demonstrates that delay in progress of the Work was directly attributable to Engineer’s failure to return submittal within 21 days
2. No extensions of time are allowed due to delays in progress of the Work caused by rejection and subsequent resubmission of data, including multiple resubmissions
3. Engineer’s review shall not extend to means, methods, techniques, sequences, construction operations, and safety precautions and programs incidental thereto. No information regarding these items will be reviewed whether or not included in submittals
4. In the event that Engineer will require more than 21 calendar days to perform review, Engineer shall so notify Contractor

B. Review drawings and data submitted only for general conformity with Contract Documents

1. Engineer's review of drawings and data returned marked No Exceptions Taken or Exceptions Noted does not indicate a thorough review of all dimensions, quantities, and details of material, equipment device or items shown
2. Engineer's review does not relieve Contractor of responsibility for errors, omissions or deviations nor responsibility for compliance with the Contract Documents

C. Assume that no shop drawing or related submittal comprises a deviation to the Contract Documents unless Contractor advises Engineer otherwise in writing which is acknowledged by Engineer in writing:
   1. Consider and review only those deviations from the Contract Documents clearly identified as such on the submittal and tabulated on the Contractor's transmittal sheet.

D. Review informational submittals for indications of Work or Material deficiencies and will respond to Contractor regarding such deficiencies

E. Return submittals to Contractor for distribution or for resubmission

F. Transmit, unreviewed, to Contractor all copies of submittals received directly from suppliers, manufacturers and subcontractors

G. Transmit, unreviewed, to Contractor all copies of submittals not called for by the Contract Documents or which have not been approved by Contractor

H. Engineer will not review uncalled-for shop drawings or product data except by special arrangement

I. Affix stamp and indicate approval for submittal or resubmission requirements with the following stamp:

☐ NO EXCEPTIONS TAKEN ☐ EXCEPTIONS NOTED
☐ REVISE & RESUBMIT ☐ REJECTED
This review was performed only for general conformance with the design concept of the project and general compliance with the information given in the Contract Documents. Modifications or comments made on the shop drawings and product data during this review do not relieve Contractor from responsibility for compliance with the requirements of the plans and specifications. Contractor is responsible for: dimensions and quantities; information that pertains solely to the fabrication processes or to the means, methods, of construction; coordination of the work of all trades.

JVA, Inc.

Date_____ By_____

1.11 SUBMITTAL SCHEDULE

A. Unless indicated otherwise, provide all submittals required by individual sections of the Contract Documents to establish compliance with the specified requirements.

B. Contractor to produce schedule of submittals for Engineer review

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 01380

CONSTRUCTION PHOTOGRAPHS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Construction record photographs prior to commencing and during the course of the Work

1.2 RELATED SECTIONS

A. Section 01010 – Summary of Work

B. Section 01700 – Contract Closeout: Project Record Documents

1.3 PHOTOGRAPHY REQUIRED

A. Take photographs of the existing conditions prior to commencing work to document existing conditions

B. Take photographs on the date on which each scheduled Application for Payment is due. Intent is for digital photos to be kept as project record

C. CD of Digital photos become the property of Owner

1.4 COSTS OF PHOTOGRAPHY

A. Pay all costs for specified photography and printing
   1. Parties requiring additional photography or prints will pay for them directly

1.5 DELIVERY OF PHOTOS

A. Submit digital photos to the Engineer with monthly pay requests or within 20 days of photo date

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.1 TECHNIQUE

A. Factual Presentation

B. Correct Exposure and Focus
   1. High resolution and sharpness

2. Maximum depth-of-field
3. Minimum distortion

3.2 VIEWS REQUIRED

A. Photograph from locations to adequately illustrate the condition of construction and the state of the Project
   1. Photographic survey of the existing site
      a. Show all areas to be modified
      b. Show all areas in which Contractor will conduct operations or store equipment
   2. Weekly photographs
      a. Minimum of eight (8) views weekly until final acceptance
      b. Views as designated by the Engineer or Owner

3.3 PHOTOGRAPH REQUIREMENTS FOR PROGRESS SITE PHOTOGRAPHS

A. Responsibility
   1. Site photographs for Owner record of construction progress shall be the responsibility of the Contractor
   2. Contractor shall be responsible for site photographs including the existing and progress of Work

B. Photographs shall include, but not limited to, the following:
   1. Existing site: Photographs of existing site conditions before site work commences
      a. Number of views shall be sufficient to cover the existing site conditions
   2. Progress of work: Shall include photographs from clearing throughout construction
      a. Number of views shall be sufficient to cover progress in Work and shall include a minimum of eight (8) different views
   3. After completion of Work: Shall be sufficient to show completed and finished Work

C. Digital images
   1. Provide images in uncompressed JPEG format
   2. Minimum resolution: 1500 x 2200
   3. Submitted digital images shall not be cropped

D. Identify each digital image file
   1. Name of project
   2. Orientation and description of view
   3. Date and time of exposure

3.4 ADDITIONAL PHOTOGRAPHS

A. Contractor shall provide additional photographs upon the request of the Engineer

B. Additional photographs may include, but not limited to, the following:
   1. Publicity photographs
   2. Special events at Project site
   3. Major phase of Work

4. Substantial Completion
5. Follow-up investigations for on-site events such as construction damage or losses
6. Additional record photographs during final acceptance

3.5 PROJECT RECORD

A. Submit CD of all photos, grouped by date

B. Engineer will distribute, after review
   1. One copy of each view to Owner
   2. One copy of each view to Engineer's file
   3. One copy of each view returned to Contractor for inclusion in Project Record Document

END OF SECTION

SECTION 01400

QUALITY CONTROL

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Quality assurance / Control of installation

B. Inspection and testing laboratory services

C. Qualification of laboratory

D. Laboratory duties

E. Limitations of authority of testing laboratory

F. Contractor's responsibilities

G. Field testing

H. Testing and services schedule

1.2 RELATED SECTIONS

A. Section 01010 - Summary of Work

B. Section 01340 - Shop Drawings, Product Data, and Samples

C. Section 01600 - Material and Equipment

1.3 REFERENCES

A. Conform to reference standard by date of issue current on date of Contract Documents

B. Obtain copies of standards when required by Contract Documents

C. Where specified reference standards conflict with Contract Documents, request clarification from Engineer before proceeding

D. The contractual relationship of the parties to the Contract shall not be altered from the Contract Documents by mention or inference otherwise in any reference document

1.4 SUBMITTALS

A. Submit under provisions of Section 01340

B. Provide copies of written reports for materials, equipment or systems as scheduled at the end of this section. Reference each report by respective section number.

C. Laboratory Test Reports: Provide written reports of each test and inspection to Engineer. Each report shall include:
   1. Date issued
   2. Project title and number
   3. Testing laboratory name, address and telephone number
   4. Name and signature of laboratory inspector
   5. Date and time of sampling or inspection
   6. Record of temperature and weather conditions
   7. Date of test
   8. Identification of product and specification section
   9. Location of sample or test in the Project
   10. Type of inspection or test
   11. Results of tests and compliance with Contract Documents
   12. Interpretation of test results when requested by Engineer

D. Shop Test Reports: Provide reports detailing results of tests and certification from manufacturer to verify compliance with specifications

E. Field Test Reports: Provide reports detailing results of the tests. Indicate compliance or non-compliance with Contract Documents. Identify corrective action for materials and equipment which fails to pass field tests.

1.5 QUALITY ASSURANCE/CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship to produce Work of specified quality

B. Comply fully with manufacturer's instructions, including each step in sequence

C. Should manufacturer's instructions conflict with Contract Documents, request clarification from Engineer before proceeding

D. Comply with specified standards as a minimum quality for the Work except when more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship

E. Secure Products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion or disfigurement

F. Inspections and testing required by laws, ordinances, rules, regulations, orders or approvals of public authorities: Conditions of the Contract

G. Certification of products: Respective sections of specifications

H. Laboratory tests required and standards for testing: Respective sections of specifications

1.6 INSPECTION AND TESTING LABORATORY SERVICES

A. Owner will employ and pay for the services of a testing agency to perform specified laboratory testing of materials where the technical specifications specifically obligate the Owner to provide the services
   1. It is the Contractor’s responsibility to initiate and coordinate all required tests and inspections including conformance with requirements of all applicable public agencies and authorities. Contractor will be responsible for coordinating the testing requirement with testing agency and provide the testing agency no less than two (2) working days advance notification to schedule tests.
   2. Employment of the testing agency shall in no way relieve Contractor's obligations to perform the Work of the Contract
   3. Contractor shall employ and pay for the services of a testing agency to perform all specified services and testing not specifically identified in the technical specifications to be provided by Owner related to the design of mixes, products and equipment, to Engineer's review of proposed materials and equipment before, during and after incorporation in the Work and to retest materials and equipment which fail original tests

B. Retesting required because of non-conformance to specified requirements shall be performed by the same testing agency on instructions by the Engineer. Payment for retesting will be charged to the Contractor by deducting inspection or testing charges from the Contract Sum/Price

1.7 QUALIFICATION OF TESTING AGENCY

A. Meet "Recommended Requirements for Independent Laboratory Qualification", published by American Council of Independent Laboratories

B. Meet basic requirements of ASTM E 329, "Standards of Recommended Practice for Inspection and Testing Agencies for Concrete and Steel as Used in Construction" as applicable

C. Authorized to operate in the State in which the Project is located

1.8 TESTING AGENCY DUTIES

A. Cooperate with Engineer and Contractor; provide qualified personnel after due notice

B. Perform specified inspections, sampling, and testing of materials and methods of construction
   1. Comply with specified standards
   2. Ascertain compliance of materials with requirements of Contract Documents

C. Promptly notify Engineer and Contractor of observed irregularities or deficiencies of work or products

1.9 LIMITATIONS OF AUTHORITY OF TESTING AGENCY

A. Testing Agency Is Not Authorized To
   1. Release, revoke, alter or enlarge on requirements of Contract Documents
   2. Approve or accept any portion of the Work
   3. Owner employed testing agency shall not perform any duties of the Contractor

1.10 CONTRACTOR'S RESPONSIBILITIES

A. Cooperate with laboratory and testing agency personnel and provide access to Work

B. Secure and deliver to the laboratory adequate quantities of representative samples of materials proposed to be used and which require testing

C. Provide to the laboratory the preliminary design mix proposed to be used for concrete and other material mixes which require control by the testing laboratory

D. Furnish copies of product test reports as required

E. Furnish Incidental Labor and Facilities
   1. To provide access to Work to be tested
   2. To obtain and handle samples at the project site or at the source of the product to be tested
   3. To facilitate inspections and tests
   4. For storage and curing of test samples

F. Cooperate with testing agency; furnish samples of materials, design mix, equipment, tools, storage and assistance as requested
   1. Notify Engineer and testing agency 24 hours prior to expected time for operations requiring services to allow for scheduling of tests and laboratory assignment of personnel
   2. Make arrangements with testing agency and pay for additional samples and tests required for Contractor's use

1.11 FIELD TESTING

A. Contractor shall pay all costs associated with standard field testing of materials as detailed in these specifications.

B. Provide all required materials, labor, equipment, water, and power required for testing

C. Perform all tests in presence of Engineer and provide one copy of field test results to Engineer same day of tests

D. Repair with no additional compensation all materials and equipment which fail during testing

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 01500

CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Temporary Utilities: Electricity, lighting, heating, ventilating, telephone service, water and sanitary facilities

B. Temporary Controls: Barriers, enclosures and fencing, protection of the Work, and water control.

C. Construction Staging Facilities: Access roads, parking areas, progress cleaning, project signage, storage and temporary buildings.

1.2 GENERAL REQUIREMENTS

A. Furnish, install and maintain all temporary utilities to assure continuous service required for the Work, except as allowed herein, and remove on completion of Work. Modify and extend systems, as work progress requires.

B. Furnish, install and maintain all construction aids required for the Work, except as allowed herein, and remove on completion of the Work

C. Furnish, install and maintain fences and barriers as required for protection of the public, property and the Work

D. Contractor may use existing roadways for access and parking only where designated by Owner.

E. Provide a field office for the use of the Contractor's Superintendent, Owner's Representatives, and Engineer in the designated staging area

F. Products may be new or used, but must be serviceable, adequate for the intended purpose, and must not violate the requirements of any applicable codes or standards

G. Clean and repair damage caused by temporary installations or use of temporary facilities. Grade and seed all disturbed areas not detailed on the drawings for other treatment

H. Provide contractor information sign posted at accessible location with contractor name and emergency phone contact information.

1.3 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies

1. Comply with applicable Federal and State rules and regulations, local codes and ordinances
2. Comply with utility company requirements

1.4 TEMPORARY ELECTRICITY

A. Contractor may use existing power outlets as long as the circuits are not overloaded.

B. Provide any additional power outlets need for construction operations, with branch wiring and distribution boxes located at the site. Provide flexible power cords as required

1.5 TEMPORARY LIGHTING

A. Existing lighting systems may be used construction purposes. Contractor shall provide additional lighting as need to complete the work.

1.6 TEMPORARY WATER SERVICE

A. Potable water maybe used from existing spigots without charge.

B. Provide all drinking water required by construction personnel and Owner's representatives.

1.7 TEMPORARY SANITARY FACILITIES

A. Provide sanitary facilities at staging area
1. As required by laws and regulations
2. Not less than 1 facility

B. Service, clean and maintain facilities and enclosures

1.8 CONSTRUCTION AIDS

A. Provide construction aids and equipment required by personnel and to facilitate the execution of the Work: scaffolds staging, ladders, stairs, ramps, runways, platforms, railways, hoists, cranes, chutes and other such facilities and equipment

B. Relocate construction aids as required by progress of construction, by storage or work requirements, and to accommodate legitimate requirements by Owner

C. Completely remove temporary materials, equipment, and services at completion of the Project

D. Clean, repair damage caused by installation or by use of temporary facilities
1. Remove foundations and underground installations for construction aids
2. Grade the areas for the site affected by temporary installations to required elevations and slopes and clean the area and seed unless specified as shown on the drawings to be different

1.9 BARRIERS

A. Provide barriers to prevent unauthorized entry to construction areas and to protect existing facilities and adjacent properties from damage from construction operations and demolition

B. Provide suitable barriers as required for public protection of Owner's employees

C. Protect non-owned vehicular traffic, stored materials, site and structures from damage

D. Install facilities of a neat and reasonable uniform appearance, structurally adequate for the required purposes

E. Relocate barriers as required by progress of construction

F. Completely remove barriers, including foundations, when construction has progressed to the point that they are no longer needed

G. Clean and repair damage caused by installation, fill and grade the areas of the site to required elevations and slopes and clean the area

1.10 PROTECTION OF INSTALLED WORK

A. Protect installed Work and provide special protection where specified in individual specification Sections

B. Provide temporary and removable protection for installed Products. Control activity in immediate work area to minimize damage

C. Protect finished driving surfaces, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects

D. Prohibit construction traffic from entering future landscaped areas after grades have been established and topsoil restored

1.11 SECURITY

A. Provide security and facilities to protect Work from unauthorized entry, vandalism, or theft

B. Coordinate with Owner's security program

1.12 PARKING

A. Paved and unpaved surfaces adjacent to the project can be used for parking.

1.13 PROGRESS CLEANING

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition

B. Remove waste materials, debris, and rubbish from site periodically and dispose off-site in accordance with local and state regulations. Due to high winds experienced at the site, waste removal must be done immediately after it is generated

1.14 UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary above grade or buried utilities, equipment, facilities, materials, prior to Final Application for Payment

B. Clean and repair damage caused by installation or use of temporary work

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 01600

MATERIALS AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Administrative and procedural requirements governing Contractor's selection of products for use in Project and for Work including, but not limited to, the following:
   1. Definitions
   2. General Requirements for Materials and Equipment
   3. Environmental Conditions
   4. Submittals
   5. Quality Assurance and Qualifications
   6. System Responsibility
   7. Transportation and Shipment
   8. Delivery, Storage and Handling
   9. Maintenance Materials
   10. Warranty
   11. Equipment and Product Selection and Identification
   12. Examination, Installation, Adjusting and Cleaning

1.2 RELATED SECTIONS

A. Section 01010 – Summary of Work

B. Section 01340 – Shop Drawings, Product Data, and Samples

C. Section 01400 – Quality Control

D. Section 01650 – Starting of Systems

E. Section 01730 – Operation and Maintenance Data

F. Section 03000 – Concrete

1.3 REFERENCES

A. American Bearing Manufacturers Association (AFBMA)
   1. Std 9-90 – Load Ratings and Fatigue Life for Ball Bearings
   2. Std 11-90 – Load Ratings and Fatigue Life for Roller Bearings

B. American Gear Manufacturer Association (AGMA)

C. ANSI B1.1-89 – Unified Screw Threads

D. ANSI B 1.20. 1-83-Pipe Threads, General Purpose (Inch)

E. ANSI B16.1-89-Cast Iron Pipe Flanges and Flanged Fittings, Class 125

F. ANSI B18.2.1-81-Square and Hex Bolts and Screws, Including Askew Head Bolts, Hex Cap Screws, and Log Screws

G. ANSI B18.2.2-87-Square and Hex Nuts

H. NSF/ANSI 60-2012 – Drinking Water Treatment Chemicals – Health Effects

I. NSF/ANSI 61-2012 – Drinking Water System Components – Health Effects

J. Hazardous (Classified) Locations: Conform to requirements of NFPA70 Articles 500 through 504

1.4 DEFINITIONS

A. Definitions used in this specification section are not intended to change the meaning of other terms used in the Contract Documents, such as “specialties,” “systems,” “structure,” “finished,” “accessories,” and similar terms. Such terms are self-explanatory and have well-recognized meanings in the construction industry

B. Products: Items purchased for incorporation in the Work, whether purchased for the Project or taken from previously purchased stock. The term “product” includes the terms “material”, “equipment”, “system”, and terms of similar intent

C. Named products: Items identified by manufacturer’s product name, including make or model number of other designation, shown or listed in the manufacturer’s published product literature that is current as of date of Contract Documents

D. Foreign products: Distinguished from “domestic products” are items substantially manufactured (50 percent or more of value) outside of the United States and its possessions. Products produced or supplied by entities substantially owned (more than 50 percent) by persons who are not citizens or, nor living within, the United States and its possessions are also considered to be foreign products

E. Materials: Products substantially shaped, cut, worked, mixed, finished, refined, or otherwise fabricated, processed, or installed to form a part of the Work

F. Equipment: Product with operational parts, whether motorized or manually operated, that requires service connections, such as wiring or piping

G. Special tools, instruments, devices, or accessories: Any tools, instruments, devices or accessories required for repair, adjustment or maintenance of equipment which are designed especially for the equipment in question or which are not normally kept in stock by local tool suppliers

H. Responsible manufacturer: Unless otherwise specified, responsible manufacturer shall be manufacturer of driven equipment. Agents, representatives or other entities who are not a direct component of manufacturing corporation will not be acceptable as a substitute for

manufacturer's corporation in meeting this requirement

1.5 GENERAL REQUIREMENTS

A. The section applies to all equipment provided under this contract

B. The requirements of detailed specifications take precedence over this section in the event of an apparent conflict

C. Provide all new equipment and materials, except as specified or required by testing

D. Equipment and materials removed from existing structure: Do not use in completed Work except where specifically indicated or specified

E. Contractor to coordinate equipment with other parts of the Work, including verification or compatibility of structures, piping, wiring and equipment components

F. Contractor is responsible for all alterations in the Work to accommodate equipment differing in dimensions or other characteristics from that contemplated in the Drawings or specifications:
   1. The arrangement of equipment shown on the Drawings is based upon information available to the Owner at the time of the design and is not intended to show exact dimensions unique to a specific manufacturer
   2. More than one manufacturer has been used for mechanical layout and design to accommodate all named manufacturer's
   3. The Drawings are, in part, diagrammatic, and some features of the illustrated equipment installation may require revision to meet actual equipment installation requirements as provided by the Contractor
   4. Structural supports, foundations, connected piping, valves and electrical conduit specified may have to be altered as coordinated by the Contractor during the submittal process to accommodate the actual equipment provided by the Contractor
   5. No additional payment will be made to the Contractor for such revisions and alterations

G. Do not use any material or equipment for any purpose other than that for which is designed or specified

H. Equipment lists presented in these specifications and as specified on the Drawings are included for the convenience of the Engineer and Contractor and are not to be considered as complete listings of all equipment, devices and material to be provided under this contract:
   1. Contractor shall prepare his own material and equipment take-off lists as necessary from the contract Drawings, addenda and this project manual to meet the requirements of this project

1.6 ENVIRONMENTAL CONDITIONS

A. Minimum Design Criteria:

1. Altitude: 5,540 feet above mean sea level
2. Outdoor air temperature: 20 to 85 degrees F
3. Relative Humidity:
    a. Summer time: 65 percent
    b. Winter time: 34 percent

1.7 SUBMITTALS

A. Provide submittals in accordance with Section 01340 – Shop Drawings, Product Data, and Samples

B. Submittals for products are specified in Section 01340 – Shop Drawings, Product Data, and Samples and in Divisions 2 through 16

C. All submittals for each component of multi-component systems shall be compiled and submitted through the Contractor to the Engineer by the manufacturer having system responsibility

D. Provide a copy of this specification section with all addendum updates included, with each paragraph check-marked to indicate specification compliance or marked to indicate the requested deviations from the specification requirements.

E. Provide Certificate of System Responsibility

F. Manufacturer's certified data showing location of critical speeds in relation to operating speeds

1.8 QUALITY ASSURANCE AND QUALIFICATIONS

A. Source limitations and interchangeability: To the fullest extent possible, provide products of the same kind from a single source

B. Nameplates: Except for required labels and operating data, do not attach or imprint manufacturer’s or producer’s nameplate or trademarks on exposed surface of products that will be exposed to view in occupied spaces or on the exterior
    1. Labels: Locate required product labels and stamps on concealed surfaces, or where required for observation after installation, on inconspicuous, accessible surfaces.
    2. Equipment nameplates: Provide a permanent nameplate on each item of service – connected or power-operated equipment. Locate on an easily accessible surface that is inconspicuous in occupied spaces. Nameplate shall contain, but not limited to, the following information and other essential operating data:
        a. Name of product and manufacturer
        b. Model and serial number
        c. Capacity
        d. Speed
        e. Ratings
        f. Operating and power characteristics
        g. Labels of tested compliance with codes and standards

3. Refer to additional requirements specified in Divisions 2 through 16

C. Installers Qualifications:
   1. Equipment and material: Installed and placed in service by or under guidance of qualified personnel having knowledge and experience necessary for proper results
   2. Where Contractor's or subcontractor's employees are not properly qualified, use personnel such as factory authorized field representative of equipment supplier

1.9 SYSTEM RESPONSIBILITY

A. Equipment systems made up of two or more components shall be provided as a single system by the responsible manufacturer. Unless otherwise specified, the Contractor shall assign system responsibility to, and obtain each system from the manufacturer of the driven equipment. The manufacturer shall design and provide all components of the system to enhance proper operation, compatibility of all components, ease of construction and efficient maintenance. The responsible manufacturer shall coordinate selection and design of all system components such that all equipment is compatible and operates properly to achieve the performance requirements specified. The Contractor is responsible to the Owner for performance of all systems as provided in the General and Special Conditions.

B. Nothing in this provision shall be construed as relieving the Contractor of overall responsibility for the Work of this Contract and the performance of all systems as specified under Division 0 - General Conditions.

1.10 TRANSPORTATION AND SHIPMENT

A. Shipment preparation: Contractor shall require manufacturers and suppliers to prepare equipment and materials for shipment in a manner to facilitate unloading and handling, and to protect against damage or unnecessary exposure in transit and storage, for contractor supplied equipment. Provisions for protection shall include the following:
   1. Crates or other suitable packaging materials
   2. Covers and other means to prevent corrosion, moisture damage, mechanical, injury, and accumulation of dirt in motors, electrical equipment, and machinery
   3. Suitable rust-preventive compound on exposed machined surfaces and unpainted iron and steel
   4. Grease packing or oil lubrication in all bearings and similar items

B. Marking
   1. Each item of equipment and material shall be tagged or marked as identified in the delivery schedule or on submittals
   2. Complete packing lists and bills of material shall be included with each shipment.
   3. Each piece of every item need not be marked separately, provided that all pieces of each item are packed or bundled together and the packages or bundles are properly tagged or marked

1.11 DELIVERY, STORAGE, AND HANDLING

A. Delivery
   1. Arrange deliveries of equipment and materials in accordance with construction schedules, in ample time to facilitate inspection prior to installation and to avoid delay of Work. Coordinate to avoid conflict with work and conditions at the site
   2. Deliver products in undamaged condition, in manufacturer's sealed, weather tight, original container or packaging, with identifying labels intact and legible, all in accordance with manufacturer's instructions and recommendations using means and methods that will prevent damage, deterioration, and loss, including theft
   3. Control delivery schedules to minimize long-term storage at the Site and to prevent overcrowding of construction spaces. Coordinate delivery and installation to ensure minimum holding or storage times for items known or recognized to be flammable hazardous, easily damaged, or sensitive to deterioration, theft, and other sources of loss
   4. Products delivered to Work site shall be in undamaged condition, in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing
   5. Mark deliveries of component parts of equipment to identify the equipment, to permit easy accumulation of parts, and to facilitate inspection and measurement of quantity or counting of units
   6. Immediately on delivery, inspect shipment to ensure:
      a. Product complies with requirements of Contract Documents and reviewed Submittals
      b. Quantities are correct
      c. Containers and packages are intact and labels are legible
      d. Equipment and materials are properly protected and undamaged
   7. Include complete packing lists and bills of material with each shipment including equipment identification number assigned by Drawings and Specifications of this Contract
   8. Deliver anchor bolts together with templates sufficiently early to permit setting when structural concrete is placed

B. Storage
   1. If there is no interior space available from the Owner for storage of delivered equipment and material at the project site:
      a. Provide adequate facilities for storage in accordance with Section 01500
      b. Provide off-site storage and protection when site does not permit on-site storage or protection and if acceptable to Owner in accordance with the General Conditions
   2. Submit and maintain insurance for equipment and materials at off-site storage
   3. Requests for payment of stored equipment and materials by the Contractor may be rejected if storage facilities do not conform to these specifications or manufacturer's written recommendations.
   4. Store equipment and materials immediately on delivery, and protect until completion of the Work. Store in accordance with manufacturer’s instructions with seals and labels intact and legible
   5. Store equipment and materials in a manner that will not endanger the supporting construction

6. Store equipment and materials that are subject to damage by elements in weathertight enclosures
7. Maintain temperature and humidity within ranges required by manufacturer
8. Protect motors, electrical equipment, plumbing fixtures, and machinery of all kinds against corrosion, moisture deteriorations, mechanical injury, and accumulation of dirt or other foreign matter
9. Protect electrical equipment, controls, and insulation against moisture, water, and dust damage
10. Immediately after delivery and inspection, connect and operate continuously all space heaters furnished in electrical equipment
11. Protect exposed-machined surfaces and unpainted iron and steel as necessary with suitable rust-preventive compounds
12. Protect bearings and similar items with grease packing or oil lubrication
13. Handle and store steel plate, sheet metal, and similar items in a manner to prevent deformation
14. Exterior storage:
    a. Provide substantial platforms, blocking, or skids to support fabricated products aboveground and to prevent soiling or staining. Cover products subject to discoloration or deterioration from exposure to elements, with impervious sheet coverings. Provide adequate ventilation to avoid condensation
    b. Store loose granular materials on solid surface areas to prevent mixing with foreign matter
    c. Provide surface drainage to prevent flow or ponding of rainwater
15. Equipment and materials shall not show any pitting, rust, decay or other deleterious effects of storage prior to final acceptance of Work
16. Arrange storage in a manner to provide easy access for inspection. Make periodic inspections of stored products to ensure products are maintained under specified conditions and free from damage or deterioration
    a. Prepare stored materials lists with schedules of maintenance activities and frequency of activities required to maintain the quality of the equipment and the warranty from the manufacturer
    b. List dates and activities of storage requirements such as rotating moveable parts
    c. Update lists weekly and include in progress meeting agenda
17. Protect painted surfaces against impact, abrasion, discoloration or other damage:
    a. Repaint any damaged areas with manufacturer provided touch-up paint
18. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to avoid condensation
19. Installed products stored prior to start-up:
    a. Equipment and materials shall not show any pitting, rust, decay or other deleterious effects of storage when installed in the Work
    b. Provide substantial coverings as necessary to protect installed products from damage from traffic and subsequent construction operations, dust, dirt, water and paint. Remove when no longer needed

C. Handling

1. Provide equipment and personnel necessary to unload and handle equipment and materials, by methods to prevent damage or soiling to equipment and materials or packaging
2. Handle by methods to prevent bending or overstressing. Where lifting points are designated, lift components only at those points
3. Provide additional protection to surrounding surfaces as necessary to prevent damage

D. Maintenance of storage
1. Inspect stored equipment and materials on a scheduled basis
2. Verify that storage facilities comply with manufacturer's product storage requirements, including environmental conditions continually maintained
3. Verify that surfaces of products exposed to elements are not adversely affected; that any weathering of finishes is acceptable under requirements of Contract Documents
4. For mechanical and electrical equipment in long-term storage, provide manufacturers service instructions to accompany each item, with notice of enclosed instructions on exterior of package. Service equipment on a regularly scheduled basis.

E. Protection after installation
1. Provide substantial coverings as necessary to protect installed equipment and materials from damage from subsequent construction operations
2. Remove when no longer needed or as specified

1.12 MAINTENANCE MATERIALS

A. Spare Parts:
1. Store spare parts, wherever required by detailed technical specification sections, in accordance with the provisions of this paragraph
2. Tag all spare parts with permanent, labeled tags or packaging by equipment designation number and identified as to part number, equipment manufacturer, and subassembly component (if appropriate)
3. Spare parts subject to deterioration such as ferrous metal items and electrical components shall be properly protected by lubricants or desiccants and encapsulated in hermetically sealed plastic wrapping
4. Unless otherwise specified, spare parts with individual weights less than 50 pounds and dimensions less than 2 feet wide, or 18 inches high, or 3 feet in length shall be stored in a wooden box:
   a. Provide box with a hinged wooden cover and locking hasp
   b. Hinges to be strap type
   c. Paint the box and identify with stenciled lettering stating the name of the equipment, equipment numbers, and the words "spare parts"
5. Prepare and provide a neatly typed inventory of spare parts taped to the underside of the box cover

1.13 WARRANTY

A. Warranty all equipment and materials against faulty or inadequate design, improper assembly or erection, defective workmanship or materials, leakage, breakage or other failure

B. Unless otherwise specified, for all equipment and materials provide manufacturer's warranty for a period of 2 years from the date of Substantial Completion

C. Warranties that begin at the time of shipment, delivery or within a limited time period from date of shipment or delivery or any other qualification that does not conform to the definition of Substantial Completion are not acceptable

D. Cost of all manufacturer warranties are considered as part of the Bid price

PART 2 PRODUCTS

2.1 MATERIALS

A. Suitable for the intended service conditions

B. Structural and miscellaneous fabricated steel in equipment shall conform to American Institute of Steel Construction (AISC) standards, except as otherwise specified

2.2 FABRICATION

A. Design, fabricate, and assemble in accordance with the best modern manufacturing and shop practices

B. Manufacture parts to standard sizes and gages

C. Two or more items of the same type shall be identical by the same manufacturer and interchangeable

2.3 EQUIPMENT AND PRODUCT SELECTION

A. General product requirements: Provide products that comply with the Contract Document, are undamaged, and unless otherwise indicated or specified, are new at time of installation
   1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect
   2. Standard products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects
   3. Continued availability: Where, because of the nature of its application, the Owner is likely to need replacement parts or additional amounts of a product at a later date, either for maintenance and repair or replacement, provide standard, domestically produced product for which the manufacturer has published assurances that the product and its parts shall be available to the Owner at a later date. A reasonable doubt regarding such future availability will be grounds for rejection of products other than named products
   4. As specified in each applicable Specification Sections, Drawings, codes, standards, and regulatory agencies

5. Fabricated products:
    a. Design, fabricate, and assemble products in accordance with best engineering and shop practices
    b. Manufacture like parts of duplicate units to standard interchangeable sizes and gauges. Two or more items of same kind shall be identically made by the same manufacturer
    c. Equipment capacities, sizes and dimensions shown or specified shall be adhered to unless variations are specifically accepted in writing by Owner
    d. Ensure that material or equipment are not used for any purpose other than that for which it is designed or is specified
    e. Labels and nameplates shall be provided where required by regulatory agencies or in accordance to state identification and essential operation data
6. Provide products of the same kind from a single source to the fullest extent possible

2.4 EQUIPMENT AND PRODUCT IDENTIFICATION

A. Nametags: Identify all valves, instruments, devices, with the equipment tag designation numbers and prefix and suffix letters as specified and/or shown on the Process and Instrumentation Drawings (P&IDs). Identification shall also be in accordance with Section 01080 – Identification Systems.

B. Nameplates: Identify all pumps and equipment with the equipment tag designation numbers and prefix and suffix letters as specified and/or shown on the Process and Instrumentation Drawings (P&IDs):
    1. Provide engraved or machine stamped non-corrosive metal nameplate fastened to the pump or equipment base plate with screws or drive pins of the same material
    2. Nameplate material shall not corrode or discolor in moist or salt water spray atmosphere
    3. Name plates indicate the following:
        a. Manufacturer
        b. Date of manufacture
        c. Name of product
        d. Model and size
        e. Serial Number
        f. Capacity: Rating in gpm or SCFM (if a fan or blower) and feet of head or inches water column
        g. Impeller or wheel diameter (if a fan)
        h. Impeller diameter
        i. Operating and power characteristics
        j. As specified herein and in Divisions 2 through 16
    4. Motor Nameplates:
        a. All motors for pumps and other equipment having motors shall be identified as specified elsewhere under this Section and in Divisions 2 through 16

PART 3 EXECUTION

3.1 EXAMINATION

A. Inspect equipment for signs of pitting, rust decay, or other deleterious effects of storage. Do not install any equipment showing such effects. Replace damaged equipment with identical new equipment

3.2 INSTALLATION

A. Install all equipment, accessories and materials in accordance with the manufacturer's written recommendations unless otherwise specified in the individual equipment detailed technical specifications

B. Each product shall be securely anchored in place except as required for proper movement and performance

C. Each product shall be located and aligned with other Work

D. Manufacturer’s Instructions
   1. Contractor shall obtain and distribute hard copies and electronic copies of manufacturer’s instructions and recommendations to parties involved in installation including a copy to Engineer
   2. Maintain one (1) set of complete instructions at job site during installation and until completion
   3. Handle, install, connect, clean, conditions, and adjust products in accordance with such instructions and in conformity with specified requirements

3.3 ADJUSTING

A. Perform all required adjustment tests, operation checks, and other startup activities required

3.4 CLEANING

A. Perform under provisions of Section 01700 – Contract Closeout

B. Repaint all painted surfaces which are damaged prior to final equipment acceptance to Owner's satisfaction

C. Clean exposed surfaces and protect as necessary and required to prevent any damage or deterioration at the time of Substantial Completion

END OF SECTION

SECTION 01650

STARTING OF SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Starting systems

B. Demonstration, instructions, and training

1.2 RELATED SECTIONS

A. Section 01730 – Operation and Maintenance Data

1.3 STARTING SYSTEMS

A. Provide Engineer with start-up and training schedule at least 14 days prior to the startup of the equipment

B. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, or other conditions which may cause damage

C. Verify that tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer

D. Verify wiring and support components for the equipment are complete and tested

E. Execute start-up under supervision of responsible manufacturer's representative in accordance with manufacturers' instructions

F. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check and approve equipment or system installation prior to start-up, and supervise placing equipment or system in operation

G. Submit a written report certifying that equipment or system has been properly installed and is functioning correctly

1.4 DEMONSTRATION AND INSTRUCTIONS

A. Demonstrate operation and maintenance of Products to Owner's personnel within 7 days prior to date of Substantial Completion

B. Utilize Operation and Maintenance Manuals as basis for instruction. Review contents of manual with Owner’s personnel in detail to explain all aspects of operation, maintenance,

and troubleshooting

C. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at scheduled times, at equipment location

D. Prepare and insert additional data in Operations and Maintenance Manuals when need for additional data becomes apparent during instruction

E. The amount of time required for instruction on each item of equipment and system is that specified in individual sections

F. Owner may videotape training sessions. Contractor and manufacturer’s trainer to cooperate with videotaping

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 01700

CONTRACT CLOSEOUT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Substantial completion

B. Final acceptance

C. Project record documents

D. Closeout procedures

E. Final cleaning

F. Final adjustment of accounts

G. Final application for payment

1.2 RELATED SECTIONS

A. Division 0 – General Conditions

B. Section 01500 – Construction Facilities and Temporary Controls

C. Section 01340 – Shop Drawings and Product Data

1.3 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Prior to requesting inspection for certification of Substantial Completion, complete the following and list exceptions in the request:
   1. In the Application for Payment that coincides with, or first follows, the date Substantial Completion is claimed, show 100% completion for the portion of the Work claimed as Substantially Complete
      a. Include supporting documentation for completion as indicated in these Contract Documents and a statement showing an accounting of changes to the Contract Price
      b. If 100% completion cannot be shown, include a list of incomplete items, the value of incomplete Work, and reasons the Work is not complete. All items remaining outstanding on the Contractor's punch list shall include a projected date of completion and/or correction with an explanation of why such item is not presently completed
   2. Advise Owner of pending insurance changeover requirements
   3. Submit specific warranties, workmanship Bonds, maintenance agreements, final certifications, and similar documents

4. Obtain and submit releases enabling Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases
5. Submit record drawings, instruction books and operating manuals, final project photographs, damage or settlement surveys, property surveys, and similar final record information
6. Deliver tools, spare parts, extra stock, and similar items
7. Make final changeover of permanent locks and transmit keys to Owner. Advise Owner's personnel of changeover in security provisions
8. Complete final clean up requirements, including touch-up painting. Touch-up and otherwise repair and restore marred exposed finishes

B. Inspection Procedures: On receipt of a request for inspection, Engineer will either proceed with inspection or advise Contractor of unfilled requirements. Engineer will prepare the Certificate of Substantial Completion following inspection or advise Contractor of construction that must be completed or corrected before the certificate will be issued
   1. Engineering will repeat inspection when requested and assured by Contractor that the Work is Substantially Complete.
   2. Results of the completed inspection will form the basis of requirements for final acceptance

1.4 FINAL ACCEPTANCE

A. Preliminary Procedures: Before requesting final inspection for certification of final acceptance and final payment, complete the following. List exceptions in the request.
   1. Submit the final payment request with releases and supporting documentation not previously submitted and accepted. Include insurance certificates for products and completed operations where required
   2. Submit an updated final statement, accounting for final additional changes to the Contract Price
   3. Submit a certified copy of Engineer’s final inspection list of items to be completed or corrected, endorsed and dated by Engineer. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance and shall be endorsed and dated by Engineer.
   4. Submit final meter readings for utilities, a measured record of stored fuel, and similar data as of the Date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work
   5. Submit consent of surety to final payment
   6. Submit evidence of final, continuing insurance coverage complying with insurance requirements

B. Reinspection Procedure: Engineer will reinspect the Work upon receipt of notice that the Work, including inspection list items from earlier inspections, has been completed, except for items whose completion is delayed under circumstances acceptable to Engineer.

1. Upon completion of reinspection, Engineer will prepare a certificate of final acceptance. If the Work is incomplete, Engineer will advise Contractor of Work that is incomplete or of obligations that have not been fulfilled but are required for final acceptance
2. If necessary, reinspection will be repeated, but at the expense of the Contractor who will reimburse the Owner for these services by the Engineer

1.5 PROJECT RECORD DOCUMENTS

A. General
1. Do not use record documents for construction purposes; protect from deterioration and loss in a secure, fire-resistive location; provide access to record documents for the Engineer's reference during normal working hours
2. Maintain on site, one set of the following record documents; record actual revisions to the Work:
   a. Contract Drawings
   b. Specifications
   c. Addenda
   d. Change Orders and other Modifications to the Contract
   e. Reviewed shop drawings, product data, and samples
   f. Field test reports
   g. Construction photographs
3. Store Record Documents and samples separate from documents used for construction
   a. Provide files and racks for storage of documents
   b. Provide locked cabinet or secure storage space for samples

B. Record Drawings
1. Maintain a clean, undamaged set of blue or black line white-prints of Contract Drawings and Shop Drawings
2. Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown
3. Mark which drawing is most capable of showing conditions fully and accurately. Where Shop Drawings are used, record a cross-reference at the corresponding location on the Contract Drawings
4. Give particular attention to concealed elements that would be difficult to measure and record at a later date
   a. Record information concurrently with construction progress
   b. Mark record sets with red erasable pencil. Use other colors to distinguish between variations in separate categories of the Work. Mark each document "Project Record" in neat, large, printed letters
   c. Mark new information that is important to Owner but was not shown on Contract Drawings or Shop Drawings
   d. Note related Change Order numbers where applicable
   e. Organize record drawing sheets into manageable sets. Bind sets with durable-paper cover sheets; print suitable titles, dates, and other identification on the cover of each set

f. Upon completion of the Work, submit record drawings to Engineer for Owner's records

5. Contract Drawings and approved Shop Drawings: Legibly mark each item to record actual construction, including:
   a. Measured depths of elements of foundation in relation to finish grade or first floor datum
   b. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvement
   c. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of construction.
   d. Field changes of dimensions and details
   e. Changes made by Addenda or Change Order(s), if any
   f. Details not on original Contract Drawings
   g. References to related Shop Drawings and Modifications

C. Record Specifications: Maintain one complete copy of the Project Manual including addenda. Include with the Project Manual one copy of other written construction documents, such as Change Orders and Modifications issued in printed form during construction
   1. Mark these documents to show substantial variations in actual Work performed in comparison with the text of the Specifications and modifications.
   2. Give particular attention to substitutions and selection of options and information on concealed construction that cannot otherwise be readily discerned later by direct observation.
   3. Note related record drawing information and product data.
   4. Upon completion of the Work, submit record Specifications to Engineer for Owner's records

D. Record Product Data: Maintain one copy of each product data Submittal. Note related Change Orders and markup of record drawings and specifications.
   1. Mark record documents to show significant variations in actual Work performed in comparison with information submitted. Include variations in products delivered to the Site and from the manufacturer's installation instructions and recommendations.
   2. Give particular attention to concealed products and portions of the Work that cannot otherwise be readily discerned later by direct observation.
   3. Upon completion of markup, submit complete set of record product data to Engineer for Owner's records
   4. Legibly mark and record at each Product section description of actual Products installed, including the following:
      a. Manufacturer's name, product model, number, trade name and supplies
      b. Product substitutions or alternates utilized
      c. Changes made by Addenda, field order or change order

E. Record Samples Submitted: Immediately prior to Substantial Completion, Contractor shall meet with Engineer and Owner's personnel at the Project Site to determine which Samples are to be transmitted to Owner for record purposes. Comply with Owner's instructions regarding packaging, identification, and delivery to Owner.

F. Miscellaneous Record Submittals: Refer to other Specification Sections for requirements of miscellaneous record keeping and Submittals in connection with actual performance of the Work. Immediately prior to the date or dates of Substantial Completion, complete miscellaneous records, and place in good order. Identify miscellaneous records properly and bind or file, ready for continued use and reference. Submit to Engineer for Owner's records

G. Maintenance Manuals: Contractor shall organize operation and maintenance data as specified in Section 01730

H. Submit documents to Engineer with claim for final Application for Payment

I. Maintain documents in a clean, dry, legible condition and in good order. Do not use record documents for construction purposes

J. Make documents and samples available at all times for inspection by Engineer

K. Label each document "Project Record" in neat, large printed letters

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION

3.1 CLOSEOUT PROCEDURES

A. General
   1. Comply with requirements stated in the Owner's General Conditions of the Contract and in these specifications for administrative procedures in closing out the Work
   2. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and ready for Engineer's inspection
   3. Provide submittals to Engineer/Owner that are required by governing or other authorities
   4. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due

B. Operation and Maintenance Instructions: Arrange for each installer of Equipment that requires regular maintenance to meet with Owner's personnel at Project Site to provide instruction in proper operation and maintenance. Provide instruction by manufacturer's representatives if installers are not experienced in operation and maintenance procedures. Include a detailed review of the following items:
   1. Maintenance manuals
   2. Record documents
   3. Spare parts, materials and tools
   4. Lubricants and fuels
   5. Identification systems

6. Control sequences
7. Hazards, hazardous chemicals data sheets
8. Cleaning
9. Warranties and bonds
10. Maintenance agreements and similar continuing commitments

C. As part of instruction for operating Equipment, demonstrate the following procedures:
1. Startup
2. Shutdown
3. Emergency operations
4. Noise and vibration adjustments
5. Safety procedures
6. Economy and efficiency adjustments
7. Effective energy utilization

3.2 FINAL CLEANING

A. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to the condition expected in a normal, commercial building cleaning and maintenance program. Comply with manufacturer's instructions.
1. Complete the following cleaning operations before requesting inspection for Certification of Substantial Completion
a. Remove labels that are not permanent labels
b. Clean exposed exterior and interior hard-surfaced finishes to a dust-free condition, free of stains, films, and similar foreign substances. Restore reflective surfaces to their original condition
c. Wipe surfaces of mechanical and electrical Equipment. Remove excess lubrication and other substances
2. Removal of Protection: Remove temporary protection and facilities installed for protection of the Work during construction
3. Compliance: Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on the Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from the Site and dispose of lawfully.
a. Where extra materials of value remaining after completion of associated Work become Owner's property. Dispose of these materials as directed by Owner

3.3 CONTRACTOR'S CLOSEOUT SUBMITTALS

A. Evidence of Payment and Release of Liens: As specified in the General Conditions

B. Final inspection reports by all regulatory agencies demonstrating the agencies' final approval

C. At Contract close-out, deliver Record Documents to Engineer for the Owner

D. Accompany Submittal with Transmittal Letter in Duplicate, Containing

1. Date
2. Project title and number
3. Contractor's name and address
4. Title and number of each Record Document
5. Signature of Contractor or his authorized representative

3.4 FINAL ADJUSTMENTS OF ACCOUNTS

A. Submit a Final Statement of Accounting to Engineer

B. Statement Shall Reflect All Adjustments to the Contract Sum
   1. The original Contract Sum
   2. Additions and deductions resulting from
      a. Previous Change Orders
      b. Deductions for uncorrected Work
      c. Deductions for liquidated damages
      d. Deductions for reinspection payments
      e. Other adjustments
   3. Total Contract Sum, as adjusted
   4. Previous payments
   5. Sum remaining due

3.5 FINAL APPLICATION FOR PAYMENT

A. Contractor shall submit the final Application for Payment in accordance with procedures and requirements stated in the General Conditions of the Contract

END OF SECTION

SECTION 01730

OPERATION AND MAINTENANCE DATA

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Submittals

B. Format

C. Content of each volume

D. Manual for equipment and systems

E. Instruction of Owner's personnel

1.2 QUALITY ASSURANCE

A. Preparation of data shall be done by personnel
   1. Trained and experienced in maintenance and operation of the described products
   2. Completely familiar with requirements of this section
   3. Skilled as a technical writer to the extent required to communicate essential data
   4. Skilled as a draftsman competent to prepare required drawings

B. Manuals for equipment systems shall be prepared by the equipment manufacturer or system supplier

C. Compile product data and related information appropriate for Owner's maintenance and operation of products furnished under the Contract

D. Prepare operating and maintenance data as specified in this Section and as referenced in other pertinent sections of Specifications

1.3 SUBMITTALS

A. Submit under provisions of Section 01340 Shop Drawings, Product Data, and Samples.

B. Manuals for equipment and systems
   1. Submit three (3) preliminary copies prior to the date of shipment of the equipment or system
      a. Engineer will review
      b. If acceptable, one (1) copy will be returned to Contractor, one (1) copy sent Owner, and one (1) copy retained in Engineer's file

c. If unacceptable, two (2) copies will be returned to Contractor with Engineer's comments for revision and one (1) copy retained in Engineer's file. Resubmit three (3) revised preliminary copies for Engineer's review
d. No partial payments will be made for equipment and systems on hand or installed until preliminary manuals are submitted and acceptable
e. See Section 01340 for electronic submittal requirements, for the preliminary copy of the O&M manual an electronic submittal is allowable

C. Submit three (3) final copies no less than 30 days prior to putting the equipment or system in service. If final manuals differ from accepted preliminary manuals, submit two (2) copies of any necessary supplemental material with instructions for insertion for conforming Engineer's and Owner's copies of preliminary manuals to final manuals
1. Engineer will compare with accepted preliminary manual
2. If identical or otherwise acceptable, Contractor will be so notified. Two (2) copies will be transmitted to Contractor, three (3) copies will be held for later transmittal to Owner
3. If not acceptable, four (4) copies will be returned to Contractor for revision or retained by Engineer and the necessary revision data requested from Contractor at Engineer's option
4. No portion of the Work is substantially complete until final equipment and system manuals relating to that portion of the Work are accepted by Engineer
5. Submit three (3) copies of any revisions found desirable during instruction of Owner's personnel with instructions for insertion for revising Owner's and Engineer's copies of manual

D. Manual for materials and finishes
1. Submit two (2) preliminary copies 15 days prior to request for final inspection
a. Engineer will review
b. One copy will be returned to Contractor with comments, one (1) retained in Engineer's file
c. No final inspection shall be conducted until preliminary manuals are submitted
2. Submit three (3) final copies, revised in accordance with Engineer's comments, within 10 days after final inspection
a. One copy will be transmitted to Contractor and two (2) copies retained by Engineer for later transmittal to Owner
b. No final payment shall be made until final manuals are submitted
3. Additional requirements for specialized instruction of Owner's personnel are given in the detailed equipment specifications

1.4 FORMAT

A. Prepare data in the form of an instructional manual for use by Owner's personnel

B. Presentation of Information
1. Size: 8 ½" by 11"
2. Paper: 20 lb weight minimum, white, for typed pages

3. Text: Manufacturer's printed data or neatly typewritten
4. Drawings
    a. Provide reinforced punched binder tab, bind in with text
    b. Reduced to 11" by 17" and folded to 8 ½" by 11"
    c. Where reduction is impractical, folded and placed in 8 ½" by 11" envelopes bound in text
    d. Suitably identified on drawings and envelopes
5. Provide flysheets for each separate product or each piece of operating equipment
    a. Provide typed description of product and major component parts of equipment
    b. Provide indexed tabs, may be in color
6. Spine and cover: identify each volume with typed or printed title "OPERATION AND MAINTENANCE INSTRUCTIONS" preceded by the word. "PRELIMINARY" or "FINAL" as applicable. Final manuals to list information on the cover and the spine. List the following:
    a. Title of project, reference Owner and project location as applicable
    b. Identity of separate structure as applicable
    c. Identity of general subject matter covered in manual and specification section number
7. As much as possible, assemble and bind material in the same order as specified

C. Binders
1. Preliminary manuals: Commercial quality permanent 3-ring or 3-post binders with durable, cleanable, hard plastic covers. GBC bound manual may be accepted upon review by Engineer
2. Final manuals: Commercial quality permanent 3-ring or 3-post binders with durable, cleanable, hard plastic covers with clear plastic cover and spine pockets suitable for title and cover inserts. Manufacturer's pre-printed binder may be accepted upon review by Engineer. "Deluxe Round Ring View Binder" as manufactured by Wilson Jones or accepted substitution
3. Final electronic manual: Provide one copy in digital format, all documents to be in native file format (Word, Excel, AutoCAD, pdf) or converted from native file format into Adobe pdf. Provide one copy on an electronic disk, CD or DVD

D. Arrange content by systems under section numbers and sequence of table of contents of this Project Manual

E. Provide tabbed flyleaf for each separate product and system, with typed description of product and major component parts of equipment

F. Electronic Manual: Compile in an electronic book format with Chapter bookmarks (equal to tabbed fly leafs) and OCR (optical character recognition) to allow for document searches.

1.5 CONTENTS OF EACH VOLUME

A. Neatly typewritten table of contents for each volume, arranged in a systematic order

1. Contractor, name of responsible principal, address and telephone number
2. A list of each product required to be included, indexed to the content of the volume
3. List, with each product, the name, address and telephone number of
    a. Subcontractor or installer
    b. Maintenance contractor, as appropriate
    c. Identify the area of responsibility of each
    d. Local source of supply for parts and replacement
4. Identify each product by product name and other identifying symbols as set forth in Contract Documents

B. Product Data
1. Include only those sheets which are pertinent to the specific product
2. Annotate each sheet to
    a. Clearly identify the specific product of part installed
    b. Clearly identify the data applicable to the installation
    c. Delete references to inapplicable information

C. Drawings
1. Supplement product data with drawings as necessary to clearly illustrate
    a. Relations of component parts of equipment and systems
    b. Control and flow diagrams
2. Coordinate drawings with information in Project Record Documents to assure correct illustration of completed installation
3. Do not use Project Record Documents as maintenance drawings

D. Written text, as required to supplement product data for the particular installation
1. Organize in a consistent format under separate headings for different procedures
2. Provide a logical sequence of instructions for each procedure

E. Copy of each warranty, bond and service contract issued
1. Provide information sheet for Owner's personnel, give
    a. Proper procedures in the event of fracture
    b. Instances which might affect the validity of warranties or bonds

1.6 MANUALS FOR EQUIPMENT AND SYSTEMS

A. Provide an operation and maintenance manual for each item of equipment or system listed in the schedule of manuals in the quantity listed in the submittal schedule

B. Content for each of equipment and system as appropriate
1. Description of unit and component parts
    a. Function, normal operating characteristics and limiting conditions
    b. Performance curves, engineering data and tests
    c. Complete nomenclature and commercial number of all replaceable parts
2. Operating procedures
    a. Startup, break-in, routine and normal operating instructions

b. Regulation, control, stopping, shutdown and emergency instructions
c. Summer and winter operating instructions, as applicable
d. Special operating instructions

3. Maintenance procedures
   a. Routine operations
   b. Guide to "trouble-shooting"
   c. Disassembly, repair and reassembly
   d. Alignment, adjusting and checking
4. Servicing and lubrication schedule
   a. List of lubricants required
5. Manufacturer's printed operating and maintenance instructions
6. Description of sequence of operation by control manufacturer
7. Original manufacturer's parts list, illustrations, assembly drawings and diagrams required for maintenance
   a. Predicted life of parts subject to wear
   b. Items recommended to be stocked as spare parts
8. As-installed control diagrams by controls manufacturer
9. Each contractor's coordination drawings
   a. As-installed color-coded piping diagrams
10. Charts of valve tag numbers with the location and function of each valve
11. List of original manufacturer's spare parts, manufacturer's current prices and recommended quantities to be maintained in storage
12. Other data as required under pertinent sections of specifications

C. Content for each electric and electronic item or system, as appropriate
   1. Description of system and component parts
      a. Function, normal operating characteristics and limiting conditions
      b. Performance curves, engineering data and tests
      c. Complete nomenclature and commercial number of replaceable parts
   2. Circuit directories of panelboards
      a. Electrical service
      b. Controls
      c. Communications
   3. As-installed color-coded wiring diagrams
   4. Operating procedures
      a. Routine and normal operating instructions
      b. Sequences required
      c. Special operating instructions
   5. Maintenance procedures
      a. Routine operations
      b. Guide to "trouble-shooting"
      c. Adjustment and checking
   6. Manufacturer's printed operating and maintenance instructions
   7. List of original manufacturer's spare parts, manufacturer's current prices and recommended quantities to be maintained in storage
   8. Other data as required under pertinent sections of specifications

D. Prepare and include additional data when the need for such data becomes apparent during instruction of Owner's personnel

E. Additional requirements for Operation and Maintenance Data: The respective sections of specifications

1.7 INSTRUCTIONS OF OWNER'S PERSONNEL

A. Prior to final inspection or acceptance, fully instruct Owner's designated operating and maintenance personnel in the operation, adjustment and maintenance of all products, equipment and system

B. Operation and maintenance manual constitutes the basis of instruction
   1. Review contents of manual with personnel in full detail to explain all aspects of operations and maintenance

1.8 Additional requirements for specialized instruction of Owner's personnel are given in the detailed equipment specifications

A. Equipment and systems Operation and Maintenance manuals shall be prepared for all equipment, devices and gates.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Cast-in-place concrete

B. Reinforcing steel

C. Forms

D. Concrete accessories

1.2 RELATED SECTIONS

A. 03600 - Grout

1.3 REFERENCE STANDARDS AND GUIDES

A. Comply with the following except as modified by supplementary requirements of this Project Specification.

B. American Concrete Institute – ACI:
1. 117 – Standard Specifications for Tolerances for Concrete Construction and Materials
2. 214R – Guide to Evaluation of Strength Test Results of Concrete
3. 301 – Specifications for Concrete Construction
4. 302.1R Guide to Concrete Floor and Slab Construction
5. 304 – Guide for Measuring, Mixing, Transporting, and Placing Concrete
6. 304.2R – Guide to Placing Concrete by Pumping Methods
7. 305.1 – Specification for Hot Weather Concreting
8. 306.1 – Standard Specification for Cold Weather Concreting
9. 308.1 – Specification for Curing Concrete
10. 309 – Guide for Consolidation of Concrete
11. 318 – Building Code Requirements for Structural Concrete
12. 347 – Guide to Formwork for Concrete
13. 350 – Code Requirements for Environmental Engineering Concrete Structures and Commentary

C. American Standards and Testing Materials (ASTM)
1. A615 – Deformed and Plain Carbon Steel Bars for Concrete Reinforcement
2. C31 – Practice for Making and Curing Concrete Test Specimens in the Field
3. C33 – Concrete Aggregates
4. C39 – Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
5. C94 – Specification for Ready-Mixed Concrete

6. C115 – Length Change of Hardened Hydraulic-Cement Mortar and Concrete
7. C143 – Standard Test Method for Slump of Hydraulic-Cement Concrete
8. C150 – Specification for Portland Cement
9. C173 or C231 – Test Methods for Air Content of Freshly Mixed Concrete
10. C260 – Air Entraining Admixtures for Concrete
11. C309 – Liquid Membrane-Forming Compounds for Curing Concrete
12. C452 – Standard Test Method for Potential Expansion of Portland-Cement Mortars Exposed to Sulfate
13. C494 – Chemical Admixtures for Concrete
14. C595 – Standard Specification for Blended Hydraulic Cements
15. C618 – Coal Fly Ash and Raw or Calcined Natural Pozzolan for use in Concrete
16. C989 – Standard Specification for Slag Cement for Use in Concrete and Mortars
17. C1157 – Performance Specification for Hydraulic Cement
18. C1602 – Mixing Water Used in the Production of Hydraulic Cement Concrete
19. D1751 – Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)

D. Concrete Reinforcing Steel Institute (CRSI)
1. Manual of Standard Practice

E. National Institute of Standards and Technology (NIST)
1. PS 1 – Structural Plywood

1.4 PERFORMANCE TOLERANCES

A. Conform to ACI 117, ACI 301, ACI 347 and ACI 350 as modified herein. In case of conflict, ACI 117 governs. ACI 350 governs where ACI 117 does not apply.

1.5 SUBMITTALS

A. Submit under provisions of Division 1 specifications

B. Shop Drawings: Reinforcing bar lists, fabrication and placement drawings
1. Indicated bar sizes, spacing, locations, and quantities of reinforcing steel. Bending and cutting schedules shall be included in all shop drawings.
2. Indicate pertinent dimensions, materials, bracing, arrangement of joints and ties, and exact location of openings, framing, and special conditions affecting work
3. All shop drawings shall be original drawings produced by the supplier and shall not be reproductions of the Contract Documents

C. Product Data: Provide sufficient information on products specified to verify compliance with specifications. Provide data on
1. Admixtures and mixes
2. Curing Compounds
3. Sealers

D. Test Reports

1. Submit reports of tentative concrete mix designs and testing prior to placing any concrete, including
    a. Slump range on which the design is based
    b. Total gal of water per cu yd
    c. Brand, type, composition, and quantity of cement with manufacturer and plant location identified
    d. Brand, type, composition and quantity of fly ash
    e. Specific gravity and gradation of each aggregate
    f. Ratio of fine to total aggregates
    g. Surface-dry weight of each aggregate per cu yd
    h. Brand, type ASTM designation, active chemical ingredients and quantity of each admixture
    i. Air content and tolerance
    j. Water/cementitious material ratio and tolerance
    k. Compressive strength based at 7- and 28-day compression tests
    l. Submit reports of field quality control testing
    m. Time of initial set
2. Submit suppliers certified fly ash test reports for each shipment delivered to concrete supplier
    a. Physical and chemical characteristics
    b. Certification of compliance with the specifications
    c. Signed by Contractor and concrete supplier
3. Existing data on proposed design mixes are acceptable if certified and complete

1.6 QUALITY ASSURANCE

A. Perform work in accordance with ACI 301. Maintain one copy of each document on site.

B. Follow recommendations of ACI 305.1 when concreting in hot weather.

C. Follow recommendations of ACI 306.1 when concreting in cold weather.

D. Acquire cement and aggregate from same source for all work

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle materials under provisions of Division 1 Specifications

B. Cement. fly ash, and other cementitious materials: Store in moisture proof enclosures, do not use if caked or lumpy

C. Aggregate: Store to prevent segregation and inclusion of foreign materials, do not use the bottom 6-inch of piles in contact with the ground

D. Reinforcing steel

1. Store on supports 6” minimum above ground, which will keep it from contact with ground and protected from oil or other materials detrimental to steel or bonding capability. Cover to prevent unacceptable surface corrosion and contamination.
2. Tag bundles of reinforcing bars and wire spirals with metal tag showing specification, grade, size, quantity and suitable identification to permit checking, sorting and placing.
3.

E. Rubber and plastic materials: Store in a cool place, do not expose to direct sunlight

F. Prepare a delivery ticket for each load of ready-mixed concrete

G. Truck operator shall hand ticket to Geotechnical Engineer or Third Party Inspector at the time of delivery with ticket to show:
1. Quantity delivered
2. Actual quantity of each material in batch
3. Outdoor temp in the shade
4. Time at which cement was added
5. Numerical sequence of the delivery
6. Quantity of water that can be added in the field based on mix design
7. Free moisture in fine and coarse aggregate in percent by weight
8. Temperature of batch

PART 2 PRODUCTS

2.1 FORMS

A. Prefabricated: Symons "Steel-Ply" or accepted substitution

B. Plywood: PS 1, waterproof resin-bonded, exterior type Douglas Fir; face adjacent to concrete Grade B or better

C. Lumber: Straight, uniform width and thickness; free from knots, offsets, holes, dents, and other surface defects

D. Chamfer strips: Clear, white pine, surface against concrete planed

E. Form coating: Colorless biodegradable oil or water based release agent that will not stain concrete and is VOC compliant. Acceptable products: Nox-Crete "Nox-Crete Form Coating", L & M "Debond", or accepted substitution

F. Form Coating where exposed to potable water: Meets NSF Standard 61, Dayton Superior “Clean Strip J1EF”, Hill and Griffith Company “Grifcote LV-50-Plus”

G. Form ties: Removable end, permanently embedded body types with waterstops not requiring auxiliary spreaders, with cones on both ends, embedded portion 1-inch minimum back from concrete face. If not provided with threaded ends, constructed for breaking off ends without damage to concrete.

2.2 REINFORCING STEEL

A. Bars: ASTM A615, Grade 60

B. Bars to be field bent: ASTM A706, grade 60.

C. Bar supports: CRSI Class 1, fabricated from galvanized wire having PVC coated legs

D. Tie wire: 16 ½ gage or heavier, black annealed wire

E. Form and fabricate reinforcing steel in accordance with ACI 315 and 318 and CRSI DA4 except as specified or indicated on Drawings, free from rust, scale and contaminants which will reduce bond.

F. Dowel Adhesive: Hilti “HIT-RE 500 V3”, Powers “PE 1000+”, Simpson “SET-XP”, or accepted substitution.

2.3 CONCRETE

A. Blended Hydraulic Cement: ASTM C595 Type IL(HS), Type IP(HS), Type IS(HS), or IT(HS). Blended Hydraulic Cements not allowed: Type IS ≥70 and Type IT(S≥70)

B. Fly ash: ASTM C618, Class F

C. Blast Furnace Slag: ASTM C989, Grade 100 or 120

D. Fine aggregate: Clean, natural sand, ASTM C33; no manufactured or artificial sand

E. Coarse aggregate: Crushed rock, natural gravel, or other inert granular material, ASTM C33 except clay and shale particles no more than 1%.
   1. Alkali Silica Reactivity: Aggregate shall be considered non-reactive with a documented satisfactory service record for a minimum ten year period used in concrete with similar cementitious material or with an alkali (Na_2O eq.) content in concrete equal or higher than that in the proposed mixture. In the absence of service record the aggregate shall be tested and will be considered non-reactive if it complies with a) or b)
      a. ASTM C1260 14-day expansion less than or equal to 0.1%, or
      b. ASTM C1293 1-year expansion less than or equal to 0.040%

F. Water: ASTM 1602

G. Admixtures
   1. Chemical Admixtures: ASTM C494, non-corrosive and chloride free.

2.4 ACCESSORIES

A. Membrane Forming Curing Compound: ASTM C309, L&M Construction Materials “Dress & Seal WB30”, BASF "MasterKure CC 200WB”, Euclid “Super Diamond

Clear VOX", Dayton Superior "Cure & Seal 1315 EF", W.R. Meadows "VOCOMP-20", or accepted substitution.

B. Curing Compound for surfaces in contact with potable water: Meets NSF Standard 61, Dayton Superior "Clear Cure VOC J7WB", Atlas Tech Products "Atlas Quantum-Cure NSF",

C. Floor Sealer: L&M Construction Materials " Dress and Seal WB30", BASF "MasterKure CC 200WB" , Euclid "Super Diamond Clear VOX", Dayton Superior "Cure & Seal 1315 EF", or accepted substitution.

D. Epoxy Bonding Agent: ASTM C881, Sika "Sikadur 32 Hi-Mod", Dayton Superior "Sure Bond J58", L&M Construction Materials "Epobond", or accepted substitution. Use when joining new to existing concrete.

E. Non-Epoxy Bonding Agent: ASTM C1059 Type II, BASF "MasterEmaco A 660", L&M Construction Materials "Everbond", Dayton Superior "Acrylic Bonding Agent J40", or accepted substitution. Use when joining new to existing concrete when bonding agent cannot be placed immediately prior to placement of new concrete.

F. Patching Mortar: Sika "Sikatop", L&M Construction Materials "Durapatch VOH", or accepted substitution.

G.

2.5 CONCRETE MIX DESIGN

A. Concrete Mix: Measure and combine cement, aggregate, water, and admixtures in accordance with ASTM C94 and ACI 211.1.
   1. Cementitious materials: When used in exposed concrete shall be one brand from one source. Do not mix different cements in same element of Work unless used in accordance with ASTM C595. Water to Cementitious materials Ratio: 0.45 maximum for 4500 psi and 4000 psi concrete
   2. Chemical Admixtures: Use is optional to aid concrete properties and allow for efficient placement. Manner of use and amount shall be in accordance with manufacturer's written recommendations and as approved by Engineer. Do not use admixtures that increase early shrinkage or negatively affect finishing.
   3. Fly Ash: Use is optional unless otherwise noted. Combine fly ash with cement at a rate of 1 pound fly ash for each pound reduction of cement. Amount of fly ash shall not be less than 15% or more than 25% of weight of cement plus fly ash. When fly ash used, minimum amount of cement designated may be proportionately reduced.
   4. Blast Furnace Slag: Use is optional unless otherwise noted. Combine blast furnace slag with cement at a rate of 1 pound of blast furnace slag for each pound reduction of cement. When blast furnace slag is used as cement replacement, blast furnace slag shall comprise 40-65 percent of the cementitious materials.
   5. Use no admixtures other than specified, unless approved by Engineer.

B. Class of Concrete:

1. Furnish in accordance with table. Cement contents listed are minimum values and shall be increased as required to attain other specified characteristics.
2. Slumps listed are maximum, except when high range water reducer is used. Maximum slump when high-range water reducer is used, 10 inches.
3. Chloride ion content shall not exceed values listed in ACI 318, Table 19.3.2.1.

Use	28-Day Compressive Strength (psi)	Coarse Aggregate (size no.)	Water to Cement ration	Air Content (%)
Interior Concrete	4000	67	0.45	No added air
Interior Equipment Pads	4000	67	0.45	No added air

2.6 FABRICATION

A. Reinforcing Steel: Accurately formed, fabricated in accordance with ACI 315 and 318 except as specified or indicated on drawings, free from rust, scale and contaminants which will reduce bond

2.7 SOURCE QUALITY CONTROL

A. Test the proposed concrete mix for each size and gradation of aggregates and each consistency intended for use in the project

B. Aggregates
1. Sample and test according to ASTM C33
2. Determine bulk specific gravity in accordance with ASTM C127 and C128

C. Fly Ash and Blast Furnace Slag: Supplier's chemical composition and physical analysis test

D. Initial set test
1. In accordance with ASTM C403
2. Test at 70 degrees F and 90 degrees ambient
3. Test at 70 degrees F on mix including specific plasticizing and entraining admixtures
4. Test at 90 degrees F on mix including specified retarding and air entraining admixtures
5. Fly ash and Blast Furnace Slag : Supplier's chemical composition and physical analysis test

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify site conditions in field or under provisions of Division 1 Specifications

B. Verify requirements for concrete cover over reinforcement

C. Verify that anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not cause hardship in placing concrete

3.2 PREPARATION

A. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent in accordance with manufacturer's instructions

B. Remove standing water, mud, and foreign matter before placing concrete

C. In locations where new concrete is dowelled to existing work, drill holes in existing concrete, insert steel dowels with dowel adhesive system.

3.3 FORMS

A. Formwork design, detailing, and installation shall be Contractor’s responsibility and shall conform to ACI 347.

B. Type of forms used is Contractor’s option, except as otherwise indicated or shown. Plywood and other wood forms shall have smooth level surfaces treated with form oil or sealer to produce clean release of concrete from forms.

1. Where wall remain exposed use plywood, prefabricated metal or wood forms; do not use boards. Lay forms out in a uniform pattern with the long dimension of the form placed vertically and joints aligned.
2. Form ties shall be plastic cone snap ties. Cone shall be min ¾ inch diameter by 1 inch deep. Taper tie through-bolt form ties may be used as an alternate to plastic cone snap ties; conform to details shown. Do not use wire ties on exposed concrete.
3. Provide ¾ inch chamfer on external corners of exposed concrete walls, beams, columns, equipment bases and exposed edges of construction joints.

C. Coat plywood and wood forms with non-staining form release agent. Apply release agent before reinforcement is placed.

D. Clean, patch, and repair form material before reuse.

E. Formwork shall prevent leakage of mortar, shall not deflect under weight of concrete and workmen, and shall withstand fluid pressure of concrete. Maximum deviation from a true plane: 1/8 inch within 6 feet

F. Brace or tie forms to maintain desired position, shape, and alignment during and after concrete placement

G. Design to produce hardened concrete to the shape, lines, and dimensions indicated on the drawings

H. Plywood or lined forms are not required for surface normally submerged or not normally exposed to view

I. Other type of forms may be used for surfaces not restricted to plywood or lined forms as backing for form lining

J. Flat segmental forms, 2 foot maximum width, may be used for curved surfaces 25 feet minimum diameter

K. Provide polyethylene film to protect concrete from water loss when placing concrete against gravel or crushed rock not containing 25 percent minimum material passing a No. 4 sieve, lap joint 4 inches

L. When placing concrete against rock, remove all loose pieces of rock and clean exposed surface with high pressure hose

M. Size and space wailers, studs, internal ties and other form supports so proper working stresses are not exceeded

N. Locations to be finished to a specified elevation, slope, or contour, bring form to true line and grade and provide a wooden guide strip at the proper location in the forms for finishing the top surface with a screed or template

O. Provide temporary opening at the bottom of columns and wall forms and wherever necessary for cleaning and inspection

P. Install form ties on exposed surfaces in uniformly spaced vertical and horizontal rows

Q. Do not remove or disturb until concrete has attained sufficient strength to safely support all dead and live loads

R. Leave shoring beneath beams and slabs in place and reinforce as required for construction equipment and materials

S. Maintain forms in place for a minimum of 40 hours for length of curing time in accordance with ACI 306.1 when temperature is 45 deg F and below

T. Remove forms carefully to prevent surface gouging, corner or edge breakage and other damage

3.4 REINFORCING STEEL

A. Accurately position reinforcing steel on supports, spacers, hangers, or other reinforcing steel at maximum intervals of 4 feet on center

B. Secure with wire ties or suitable clips. Tie 50 percent of all reinforcement and reinforcement at intersections for wall and floor construction

C. Except at contact splices, minimum clear distances between bars, the greater of
   1. Nominal diameter of bars
   2. 1.5 times max size of coarse aggregate

D. Splices
   1. As specified or indicated on the drawings
   2. Splices at other locations will be acceptable, if approved by the Engineer
   3. Do not weld or tack weld reinforcing steel
   4. Remove and replace steel upon which any unauthorized welding has been performed

3.5 EMBEDMENTS

A. Accurately position and securely anchor in forms, anchor bolts, steel shapes, conduit, sleeves, masonry anchorages, and other materials to be embedded in concrete

B. Cast pipe and other embedded items into concrete as placement progresses. Do not provide blockouts.

C. Do not place ducts, conduit, and pipes in slabs on grade. Place minimum 4 inches below slab

D. Place items constructed of dissimilar metals to avoid physical contact with reinforcing. Secure item and reinforcing to ensure they will not shift and come into contact during concrete placement. Contact between reinforcing steel and other metal, other than bare, coated, or plated carbon steel not permitted.

E. The following restrictions shall be adhered to, unless otherwise noted
   1. No duct, conduit, pipe, or fitting placed vertically shall be larger in cross-sectional area than 4% oc column into which it is placed.
   2. Duct, conduit, pipe, and fittings, when placed within slabs or walls
      a. Shall not be larger than 1/3 thickness of slab or wall
      b. Shall be placed within the middle 1/3 of slab or wall where possible
      c. Shall not be placed closer than 3 outside diameters clear from each other when parallel
      d. Shall cross each other at right angles
      e. Shall be secured to prevent shifting of “floating” during concrete placement
      f. Multiple conduits shall not cross each other at the same location
      g. Except for conduits that must run up a column, keep conduits a minimum of 2 to 3 feet away from columns

h. Where conditions require conduit to be tied to the inside face of the reinforcing mat, the conduit shall be galvanized steel or PVC, shall be placed 3 outside diameter clear away from the parallel reinforcement bar.

3. Reinforcing steel shall be in place before embedded items placed and reinforcing cut or removed shall be replaced with additional reinforcing as indicated.
4. Do not pass sleeves through columns or beams without Engineer's approval.

F. Anchor bolts
1. Unless installed in pipe sleeves, provide sufficient threads on anchor bolts to permit a nut on the concrete side of the form or template
2. Install a second nut on the other side of the form or template
3. Adjust the nuts to hold the bolt rigidly in the proper position

G. Clean embedments before installation

3.6 TRANSPORTING MIXED CONCRETE

A. Transporting of mixed concrete shall conform to ACI 304R.

B. Maximum delivery time from batch plant is 90 minutes unless stated otherwise by the supplier and approved by the Owner/Engineer.

C. Mix concrete in accordance with ASTM C94.

D. Do not exceed manufacturer's guaranteed capacity of truck agitators. Maintain the mixed concrete in a thoroughly mixed and uniform mass during hauling.

E. Additional mixing water is permitted as long as the specified water cement ratio of the mix is not exceeded. Batched water quantities and added water quantities must be accurately recorded for verification. If additional water is to be incorporated into the concrete, revolve the drum not less than 30 revolutions at mixing speed after the water is added and before placing concrete. Addition of water is not permitted after concrete testing has occurred.

F. Notify Special Inspector of any water added to the concrete mixture

G. A water measuring device in good working condition, mounted on each transit mix truck, shall be used for measuring the water added to the mix on site or in transit.

H. Provide delivery ticket to Special Inspector or Owner and comply with delivery requirements of this section

3.7 PLACING CONCRETE

A. Place concrete in accordance with ACI 304, ACI 301, and ACI 318

B. Schedule and attend pre-pour meeting with Owner at least 7 days before first pour to review requirements of this specification

C. Notify Engineer and Owner not less than 48 hours in advance of the times and places at which contractor intends to place concrete

D. Predetermine limits at each pour and place all concrete within limits of pour in one continuous operation

E. Rigidly secure forms, reinforcing steel, embedment, and anchor bolts in proper position

F. Remove all mud, water, and debris from space to be occupied by concrete

G. Clean surfaces encrusted with dried concrete from previous concrete operations

H. Convey to the point of final deposit by methods which will prevent separation or loss of ingredients

I. Place concrete in final position without being moved laterally more than 5 feet

J. Place concrete in horizontal layers not more than 2 feet of depth to allow for proper consolidation

K. Place subsequent layer while the preceding layer is still plastic

L. Top finish concrete when thoroughly settled

M. Remove all laitance, debris, and surplus water from the tops of the forms by screeding, scraping or other effective means

N. Clean concrete spatter and other foreign substances from surfaces not in contact with concrete.

3.8 BONDING TO HARDENED CONCRETE

A. Place new concrete on rough, clean, damp faces of existing concrete

B. Roughen concrete to be bonded to future concrete to 1/4 inch amplitude

C. Remove surface mortar of smooth surfaces to expose aggregate

D. Clean hardened concrete of all foreign substances, including curing compound, washed with clean water, and keep saturated for 24 hrs preceding placement of fresh concrete

E. Apply epoxy bonding agent for bonding to hardened concrete

3.9 CONSOLIDATION

A. Thoroughly consolidate concrete during and immediately after placement

B. Work concrete around all reinforcements and embedments and into the corners of the forms

C. Use mechanical vibrators which will maintain 9,000 cycles per minutes when immersed in the concrete, 1 ½ hp motor minimum

3.10 COLD WEATHER CONCRETING

A. Conform to ACI 306.1, except as modified herein

B. Minimum concrete temp at the time of mixing: Refer to Table 5.1 of ACI 306R-10

Outdoor Temp at Placement (in shade)	Minimum Concrete Temp at Mixing (Concrete Sections 12" or Greater)
Below 0°F	65°F
Between 0°F & 30°F	60°F
Above 30°F	55°F

C. Do not place heated concrete which is warmer than 80 degrees F

D. If freezing temperatures are expected during curing, maintain the concrete temperature in accordance with ACI 306R-10, Table 7.1

E. Do not allow concrete to cool suddenly.

3.11 HOT WEATHER CONCRETING

A. Conform to ACI 305.1, except as modified herein

B. At air temp of 90 degrees F and above keep concrete as cool as possible during placement and curing

C. Do not allow concrete temperature to exceed 85 deg F at placement

D. Prevent plastic shrinkage cracking due to rapid evaporation of moisture

E. Do not place concrete when the actual or anticipated evaporation rate equals or exceeds 0.2 lbs per sq ft per hr as determined from ACI 305R-10, Fig 4.2

3.12 CONSTRUCTION JOINTS

A. Before concrete placed, construction joints shall be cleaned, laitance removed, and surface wetted. Remove standing water.

B. Construction joints shall have keys or roughened surfaces. Where roughened surfaces are used, surface shall have amplitude of ¼ inch minimum.

3.13 FINISHING SLABS AND FLATWORK

A. Slab Finishes:

Description	Concrete Finish
Sealer Applied Floors and Slabs	3 Trowelings

B. After placement, screed concrete with straightedges, power strike-offs or vibrating screeds.

C. After screeding, bull float or darby surfaces to eliminate ridges and to fill in voids left by screeding.

D. Trowel:
1. Use steel trowels.
2. Use power or hand troweling.
3. Final troweling shall be by hand and continue until concrete surface consolidated to uniform, smooth, dense surface free of trowel marks and irregularities.

E. Floor Sealer:
1. Apply in accordance with manufacturer's written instructions.
2. Apply first coat after final troweling, surface water glaze has dissipated, and when surface is hard enough to sustain foot traffic on same day as pour.
3. When floor has been water cured, apply first coat after curing has been completed. Apply within one day of floor being dry enough for application.
4. Apply second coat after Work completed and ready for occupancy.

F. Tolerances:
1. Concrete slabs shall be within 3/16 inch of 10 foot straightedge in all directions except where slabs are dished for drains. Deviations from elevation indicated shall not exceed 3/4 inch.
2. Pitch floor to floor drains minimum 1/8 inch per foot or as shown. Pitch bottom of slab or beam to match top slope to maintain thickness or depth indicated. As an alternate, bottom of slab or beam may be placed level provided that min thickness or depth is maintained.

3.14 FINISHING FORMED SURFACES

A. Remove fins and other surface projections from all formed surfaces except exterior surfaces that will be in contact with earth backfill and are not specified to be dampproofed

B. Use a power grinder, if necessary, to remove projections and provide a flush surface

C. Remove fins and fill all tie holes on surfaces exposed to view
1. Clean, dry and fill plastic cone snap tie holes with Patching Mortar. Fill taper tie through-bolt form tie holes with Non-Shrink Grout.
2. Finish flush to match the texture of adjacent concrete
3. All surfaces exposed to view shall have grout cleaned rubbed finish

a. Use non-shrink grout mix with bonding agent.
b. Wet surface and scrub grout into voids and remove excess material.
c. Finished surface shall have smooth appearance free of marks, voids, surface glaze, and cement dust.

3.15 CURING AND PROTECTION

A. Protect concrete from frost and keep moist for min curing period of 7 days after placement in accordance with ACI 308.
1. Formed Surfaces:
a. Wet cure by spraying surfaces as frequently as drying conditions may require to keep concrete surfaces moist.
b. Surfaces may be cured by leaving forms in-place. For vertical surfaces, apply water to run down inside of forms, if necessary, to keep concrete moist.
c. After forms are removed, wet cure for remainder of curing period or apply curing compound.
d. Do not use curing compound where mortar, grout, concrete, or other coatings or adhesives will be applied.

B. Curing Compound:
1. Apply curing compound at uniform rate sufficient to comply with requirements for water retention as specified and as measured in accordance with ASTM C156.
2. Cover areas subjected to direct sunlight with ambient temperature expected to exceed 80°F with white pigmented compound, other surfaces may be covered with fugitive dye compound.

C. Water curing
1. Begin water saturation as quickly as possible after initial set
2. Regulate water application to provide complete surface coverage with minimum runoff
3. Interrupt the application of water to walls for grout cleaning only over the area being cleaned at the time and do not permit the surface to become dry during such an interruption

D. Protect from damaging mechanical disturbances, load stresses, heavy shock, and excessive vibration.

E. Protect finished concrete surfaces from damage caused by construction equipment, materials, and methods, and from rain or running water.

F. Do not load self-supporting structures to overstress concrete.

3.16 REMOVAL OF FORMING AND SHORING

A. Do not remove forming or shoring until member supported has acquired sufficient strength to safely support own weight and any imposed loads. Forming shall remain in place for at least min time recommended by ACI 347. In addition, forming for horizontal members shall remain in place minimum 7 days. In no case shall forming for

horizontal members be removed before concrete has reached 85% of specified design strength.

B. Reshore areas as required to carry additional imposed loads.

3.17 DEFECTIVE CONCRETE

A. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.

B. General:
1. Prior to starting repair work, obtain Engineer's approval of proposed repair techniques and materials.
2. Method of repair shall not adversely affect the appearance of the finished structure.
3. Develop repair techniques on portion of as-cast surface selected by Engineer. Surface of repair remaining exposed to view shall match color and texture of adjacent surfaces.
4. Prepare surfaces, apply and install materials, and cure as recommended by material manufacturers.

C. Defective Areas:
1. Remove honeycombing, stone packets, spalls, and other defective concrete down to sound concrete. If chipping required, make edges perpendicular to surface. Do not feather edges.
2. Fill defective area with patching mortar

3.18 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed in accordance with ACI 301 under provisions of Section 01400

B. Owner's geotechnical consultant provide field and compressive strength tests to determine compliance of concrete materials in accordance with the specifications except as indicated otherwise under provisions of Section 01400

C. The Owner shall pay for compressive strength tests to determine compliance of concrete material in accordance with the specifications

D. Concrete Field Tests
1. Tests by ACI certified technician
2. Concrete Test Samples: Samples for acceptance tests on concrete shall be obtained in accordance with ASTM C172 at the point of placement or discharge.
3. Provide all equipment, supplies, and the services of one or more employees, as required
4. The test frequencies specified are minimum. Additional tests may be performed as required by the job conditions

E. Slump: Provide a sample from each truck load in accordance with ASTM C143 if requested by Engineer and when making test cylinders

F. Compression Tests
   1. Provide one set of 6 cylinders each day when up to 50 cu yds have been placed
   2. Make one additional set of 6 cylinders for each additional 50 cu yds or each major pour placed in one day
   3. Test two cylinders in each set at 7 days
   4. Test two cylinders in each set at 28 days
   5. The other two cylinders to be used as directed by Engineer at any time
   6. Engineer will evaluate in accordance with ACI 214 and 318
   7. Make, cure, store, and deliver cylinders in accordance with ASTM C31
   8. Test in accordance with ASTM C39
   9. Mark or tag each set of test cylinders with the date and time of day the cylinders were made, the location in the work where the concrete represented by the cylinders was placed, the delivery truck or batch number, the air content, and the slump

G. Storage Facilities for Concrete Test Cylinders
   1. Including water necessary, a specially prepared box with high-low thermometer and thermostatically controlled heating devices in accordance with ASTM C31

H. Failure of Test Cylinder Results: Evaluation of concrete structures where laboratory-cured cylinders fail to meet 28-day concrete strength requirements of the contract documents will be subject to, but not limited to, the following measures.
   1. Upon failure of 28-day test cylinder results, the Engineer may require the Contractor, at his expense, to obtain and test at least three 4-inch diameter cored samples from area in question
   2. Concrete will be considered adequate if average of three core tests is at least 85 percent of, and if no single core is less than 75 percent of, the specified 28-day strength. Where concrete durability is a concern due to freeze thaw or sulfate exposure the Engineer may reject concrete that passes ACI 318 core testing criteria for strength, but fails to meet acceptance criteria for cylinder testing.
   3. In the event an area is found to be structurally unsound, the Engineer may order removal and replacement of concrete as required. The cost of the core tests and removal and replacement of defective concrete shall be borne by the Contractor
   4. Fill all core holes as specified for repairing defective concrete
   5. Additional measures may be required at the direction of the Engineer in accordance with ACI 350

END OF SECTION

SECTION 03600

GROUT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Patching cavities in concrete

B. Other grouting specified or indicated on Drawings

1.2 REFERENCES

A. ASTM C109 – Test Method for Compressive Strength of Hydraulic Cement Mortar

B. ASTM C157 – Test Method for Length Change of Hardened Hydraulic Cement Mortar and Concrete

C. ASTM C191 – Time of Setting of Hydraulic Cement by Vicat Needle

1.3 SUBMITTALS

A. Submit under provisions of Section 01340

B. Product Data: Provide manufacturer's catalog sheet for material indicating test data and physical properties

1.4 QUALITY ASSURANCE

A. Conform to applicable industry standard, Corps of Engineers, Specification CRD-C 621 - Specification for non-shrink grout

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Epoxy Grout
   1. L&M Inc. - Epogrout
   2. Sika - Sikadur 42, Grout Pack
   3. Or accepted substitution

2.2 MATERIALS

A. Epoxy Grout: Three Component Epoxy Resin System
   1. Two liquid epoxy components
   2. One inert aggregate filtered component
   3. Each component furnished in separate package for mixing at job site

B. Water: Clean and free from deleterious substances

PART 3 EXECUTION

3.1 PREPARATION

A. Epoxy Grout: Apply only to clean, dry, sound surface

3.2 APPLICATION

A. Epoxy Grout
   1. Mix and place in accordance with manufacturer's instructions
   2. Completely fill all cavities and spaces around dowels and anchors without voids
   3. Obtain manufacturer's technical assistance as required to insure proper placement

3.3 SCHEDULE

A. Epoxy Grout
   1. Patching cavities in concrete including, but not limited to, tie holes, and structural and equipment support

END OF SECTION

SECTION 05500

METAL FABRICATIONS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Provide miscellaneous metal work shown on the Drawings, as specified herein, and as needed for a complete and proper installation.

B. Section Includes:
   1. Concrete anchors
   2. Bar grating
   3. Miscellaneous items

1.2 REFERENCES AND STANDARDS

A. AISC: American Institute of Steel Construction

B. AA: Aluminum Association

C. AWS: American Welding Society

D. ASTM: American Society for Testing and Materials

E. AISI: American Iron and Steel Institute

F. OSHA: Occupational Safety and Health Administration

1.3 SUBMITTALS

A. Shop Drawings:
   1. Indicate materials, sizes, connections, anchors, and finishes.

B. Product Data
   1. Manufacturer’s catalog sheets and premanufactured items.

C. Miscellaneous Submittals:
   1. Floor access hatch warranty.

D. Submit in accordance with Section 01340.

1.4 QUALITY ASSURANCE

A. Perform shop and/or field welding required in connection with the work of this Section by certified welders in strict accordance with pertinent recommendation of AWS.

B. Conform to AISC and AA standards.

PART 2 GENERAL

2.1 MATERIALS

A. In fabricating items which will be exposed to view, limit materials to those which are free from surface blemishes, pitting, and roughness.

B. Comply with following standards, as pertinent.
   1. Steel Shapes unless noted otherwise below: ASTM A36
      a. W-Shapes: A992
      b. Steel Plates and Bars: A572
   2. Square or rectangular tubing: ASTM A500, Grade C.
   3. Round tubing: ASTM A500, Grade C.
   4. Pipe: ASTM A53, Grade B
   5. Stainless Steel:
      a. Interior uses: AISI, Type 304 or Type 316
   6. Aluminum shapes and plates: Alloy 6061-T6 or 6063-T6
   7. Connection Bolts:
      a. For steel members: ASTM A325
      b. For aluminum and galvanized steel members: Stainless steel
   8. Cast-in-place anchor bolts:
      a. ½ inch minimum diameter
      b. Nonsubmerged: ASTM A307, galvanized
   9. Cast Aluminum: ASTM B26

2.2 CONCRETE ANCHORS

A. Expansion Anchors:
   1. Manufacturers:
      a. Kwik Bolt 3 or Kwik Bolt TZ by Hilti
      b. Power-Stud+ SD1 or SD2 by Powers Fasteners
      c. Strong-Bolt or Strong-Bolt 2 by Simpson Strong-Tie Co., Inc.
      d. Red Head Trubolt+ or Trubolt Wedge Anchor by ITW Commercial Construction
   2. Usage: In concrete
      a. 316 Stainless Steel
      b. Do not use when submerged or subjected to dynamic loads.

B. Adhesive Anchors:
   1. Manufacturers:
      a. HIT RE-500-V3 or HIT-HY 200-A by Hilti Corp.
      b. AC100+ Gold or PE 1000+ by Powers Fasteners
      c. AT or SET-XP Epoxy Adhesive System by Simpson Strong-Tie Co., Inc.
      d. Red Head Epcon S7, A7, G5 or C6 Adhesives by ITW Commercial Construction
   2. Epoxy adhesive with 316 Stainless steel stud assembly.
   3. Usage:

a. In concrete, submerged
b. In masonry, provide screen tube inserts
c. Do not use in overhead applications

C. Screw Anchors:
1. Manufacturers”
a. Kwik-Con II or Kwik HUS / HUS-EZ by Hilti Corp.
b. Wedge-Bolt+ or Tapper+ by Powers Fasteners
c. Titen or Titen HD by Simpson Strong-Tie CO., Inc.
d. Red Head Tapcon or Large Tapcon (LDT) anchors by ITW Commercial Construction
2. Stainless steel concrete/Masonry screw with hex head.
3. Usage:
a. In concrete

2.3 FINISHES

A. Galvanizing Repair Paint: High zinc-dust content paint complying with MIL-P-21035

2.4 FABRICATION

A. Except as otherwise shown on the Drawings or the approved Shop Drawings, use materials of size, thickness, and type required to produce reasonable strength and durability in the work of this Section.

B. Provide clips, lugs, brackets, straps, plates, bolts, nuts, washers, and similar items, as required for fabrication and erection.

C. Fabricate with accurate angles and surfaces which are true to the required lines and levels, with projecting corners clipped, grinding exposed welds smooth and flush, forming exposed connections with hairline joints, and using concealed fasteners wherever possible.

D. Weld shop connection and bolt or weld field connections.

E. Galvanizing:
1. Galvanize after fabrication.
2. Galvanize by hot-dip process conforming to ASTM A123 and AHDGA specifications.

2.5 ALUMINUM BAR GRATING FOR STAIR AND PLATFORM

A. Manufacturers:
1. McNichols, Type 19-S-4
2. Ohio Grating, Type 19-SG-4
3. Barnett Bates, Type 19-AP-4
4. Klemp Grating, Type KRP-19-4

B. Materials:
   1. Pressure locked serrated grating (expanded tube or swaged type).
   2. Alloy 6061-T6 or 6063-T6
   3. Bearing bars shall be spaced at 1 3/16 inch on center
   4. Cross bars shall be spaced at 4 inch on center
   5. Size bearing bars as follows

Maximum Clear Span (ft - in.)	Bearing Bar Size (depth below serrations) (in.)
3 - 8	1-1/4 x 1/8
in.= inch ft = feet	

C. General
   1. Provide shop-fabricated grating and accessories such as frames, support angles, fasteners, and treads
   2. Grating and treads shall be serrated aluminum
   3. Treads and exposed edges of grating shall have corrugated or cast aluminum abrasive nosing.
   4. Provide fastening devices to firmly anchor grating and treads to supports. Sections designated as removable shall not be attached to supports.
      a. Minimum of 4 per panel
      b. Shall allow for repeated removal
      c. Saddle clip type
      d. "G" clip type
      e. Clamp type
      f. Minimum ¼ inch bolts or self-tapping screws
      g. 316 stainless steel
   5. Provide trim banding or load carrying banding on edges and cutouts welded to grating.
      a. Bearing bars not resting on supports shall have load carrying banding sized to span opening

D. Grating Support angles and framing
   1. Galvanize steel members supporting aluminum grating.

2.6 MISCELLANEOUS ITEMS

A. Fabricate miscellaneous framing, supports, and items of structural shapes, plates, bars, and tubing or sizes and arrangements indicated and as required.

PART 3 EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. General:
   1. Set work accurately into position, plumb, level, true and free from rack.
   2. Tolerance: 1/8 inch in 10 feet
   3. Anchor firmly into position
   4. Where field welding is required, comply with AWS recommended procedures for appearance and quality of weld and for methods to be used in correction welding work.
   5. Grind exposed welds smooth, and touchup shop prime coats.
   6. Do not cut, weld, or abrade surfaces which have been hot-dip galvanized after fabrication and which are intended for proper installation. Drill field holes for bolts, for not burn holes.
   7. Perform cutting, drilling, and fitting as required for proper installation. Drill field holes for bolts, do not burn holes.
   8. Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint the exposed areas with same material used for shop priming.

B. Concrete Anchors:
   1. Do not install until concrete or masonry has reached design strength.
   2. Do not install closer than 6 bolt diameters to edge of concrete of masonry, or closer than 12 bolt diameters to another anchor unless noted otherwise
   3. Minimum embedment shall be 8 bolt diameters unless noted otherwise
   4. Install in accordance with manufacturer’s recommendations.

3.3 ADJUSTING AND CLEANING

A. Clean exposed surfaces, removing dirt, dust, and other foreign matter.

B. Prepare surfaces for finished painting as specified in Section 09900

C. Field repair of damaged galvanized coatings:
   1. Repair surfaces damaged during shipping, erection, or construction operations.
   2. Use zinc rich paint
   3. Prepare surfaces and apply in accordance with ASTM A780, Annex A2.

END OF SECTION

SECTION 06525

FIBERGLASS REINFORCED PLASTIC FABRICATIONS

PART 1 GENERAL

1.1 SUMMARY

A. Provide fiberglass fabrications as shown on the Drawings, as specified herein, and as needed for complete and proper installation.

B. Section Includes:
   1. Design, fabrication, and erection of fiberglass shelves and Unistrut
   2. System accessories.

1.2 REFERENCES

A. ASTM: American Society for Testing and Materials

B. OSHA: Occupational Safety and Health Administration

1.3 SYSTEM DESCRIPTION

A. Design Requirements:
   1. FRP shelving
      a. Conform to manufacturers requirements to support continuously circulating diaphragm pumps as specified in the drawings.
      b. Conform to manufacturers requirements to support water booster pumps as specified in the drawings.
   2. FRP Unistrut
      a. Conform to manufacturer requirements to support piping and shelving as specified in the drawings.

1.4 SUBMITTALS

A. Shop Drawings:
   1. Type, layout, dimensions, fasteners, and locations.

B. Product Data:
   1. Manufacturer’s literature.

C. Submit in accordance with Section 01340.

1.5 QUALITY ASSURANCE

A. FRP shelving and Unistrut shall be end product of one manufacturer to achieve standardization of appearance.

PART 2 PRODUCTS

2.1 GENERAL

A. Provide shop-fabricated shelving and Unistrut and accessories such as frames, support angles, and fasteners.

B. Seal cut edges with compatible resin.

C. Provide fastening devices to firmly anchor grating and treads to supports. Sections designated as removable shall not be attached to supports.

D. Concrete anchors shall conform to requirements of Section 05500.

2.2 SHELVING AND UNISTRUT

A. Manufacturers:
   1. Dynadeck by Fibergrate
   2. SAFPLANK by Strongwell.
   3. Or equal.

B. Materials:
   1. Premium polyester UV inhibited resin with continuous glass filament reinforcement.
   2. Resin rich exterior surfaces free of air bubbles and dry glass.

2.3 ACCESSORIES

A. Bolts, rivets, and other connectors shall be 316 SST.

B. Concrete anchors shall be stainless steel conforming to requirements of Section 05500.

PART 3 EXECUTION

3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Install in accordance with manufacturer’s written instructions.

B. Seal cut edges with compatible resin.

END OF SECTION

SECTION 09900

COATINGS

PART 1 GENERAL

1.1 SUMMARY

A. Coating of surfaces as specified herein, including:
   1. Exposed interior ferrous metal, ductile iron, or cast iron piping, regardless of factory-applied finish.

B. Labeling and directional arrows on piping, equipment, valves, and ducts whether coated or not coated is specified in Section 01080.

C. Do not coat the following unless specifically noted otherwise:
   1. Factory-finished electrical motor control panels (MCC), main instrument panels (MIP), flow indicators, and related equipment.
   2. Moving parts of operating units, electrical parts, linkages, sensing devices, and motor shafts.
   3. Buried equipment and piping.
   4. Surfaces above ceilings.
   5. Factory-finished trim.
   6. Stainless steel, chrome plate, copper, bronze, galvanized surfaces, and similar finished materials.
   7. Aluminum ductwork or aluminum faced insulation.
   8. Aluminum louvers and trim.
   9. Concrete tanks.
   10. Plastic and FRP piping, equipment, and ductwork.

D. Do not coat over any code-required labels such as UL and Factory Mutual, or any equipment identification, performance rating, name, or nomenclature plates.

E. Equipment manufacturers are responsible for surface preparation and coating of equipment, motors, and appurtenances. Equipment to be coated and coating system is identified in the equipment specification sections.

1.2 DEFINITIONS

A. Definitions as used in Coating Schedule included herein.
   1. Coatings: Paint or heavy duty finishes for use on surfaces subject to interior and exterior exposure, submergence, high moisture, splash, or chemical environment, including primers, sealers, fillers, and intermediate and finished coats.
   2. First Coat: Field primer, factory primer, or shop primer. When only one coat is required, first coat is the finished coat.
   3. Second, Third, or Intermediate Coats: Successive finished coats applied over first coat.
   4. DFT: Dry film thickness (mils/coat).

5. sfpg: Square feet per gallon (per coat).

1.3 REFERENCES

A. MSDS: Material Safety Data Sheets

B. ASTM: American Society for Testing and Materials

C. SSPC: The Society for Protective Coatings

D. OSHA: Occupational Safety and Health Administration

E. NSF: National Sanitation Foundation

1.4 SUBMITTALS

A. Product Data:
   1. Manufacturer's literature including application recommendations and generic makeup for each coating scheduled.
   2. Factory or shop-applied primer manufacturer's literature including application recommendations and generic makeup shall be submitted with all material and equipment submittals. All primers shall conform to the requirements of this Section.

B. Samples:
   1. Actual color samples available for each coating scheduled.

C. Miscellaneous:
   1. Schedules:
      a. Schedule of proposed coating systems within 60 days after Notice to Proceed.
      b. Schedule of proposed coating systems shall contain all information as indicated in Coating Schedule included herein.
   2. Submit one copy of manufacturer's MSDS, for each type of coating, to Engineer's field office for information. Contractor shall post copy of MSDS on Site at all times coating is in progress.

D. Submit in accordance with Section 01340.

1.5 QUALITY ASSURANCE

A. Regulatory Requirements:
   1. All coatings shall conform to OSHA requirements for allowable exposure to lead and other hazardous substances.

B. Applicator Qualifications:
   1. Engage an experienced field applicator with a minimum of 5 yrs successful experience and who has successfully completed coating system applications similar in material and extent to those indicated.

C. Single-Scource Responsibility:

1. Provide coating material produced by same manufacturer for each system.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Materials shall be delivered to site in original containers with labels intact and seals unbroken.

B. Protect and heat or cool material storage location to maintain temperature ranges recommended by coating manufacturers, but not less than 55° F.

C. Avoid danger of fire. Oily rags and waste must be removed from buildings each night or kept in appropriate metal containers. Provide fire extinguishers of type recommended by coating manufacturer's in areas of storage and where finishing is occurring. Allow no smoking or open containers of solvent.

D. Empty containers shall have labels canceled and clearly marked as to use.

1.7 PROJECT / SITE CONDITIONS

A. Environmental Requirements:
1. Dry-heat and ventilate areas to obtain conditions recommended by coating manufacturer.
2. Relative humidity conditions as specified by coating manufacturer shall be adhered to.
3. No unprotected, unheated exterior coating shall be undertaken when cold, damp, foggy, or rainy weather appears probable, nor when the temperature of the substrate is below 55° F, unless approved in writing by coating manufacturer.
4. Maintain manufacturer's environmental requirements until coating is fully cured.
5. Apply no coating in areas where dust is being generated.
6. Testing and disposal of any waste and coating shall be the responsibility of the Contactor.

B. Protection:
1. Drop cloths shall be provided in all areas where coating is done to fully protect other surfaces.
2. Remove hardware, accessories, plates, lighting fixtures, and similar items or provide protection by masking. Upon completion, replace items or remove protection and clean.

C. It is the intent of this Section that all ferrous metal items scheduled for coating be shop-primed. If items are not shop-primed, surfaces shall be prepared and coated in the field as specified.

D. Upon Substantial Completion, remaining unused material will become property of Owner. Seal material as required for storage, mark contents with color, type, location, and shelf life, and store on Site where required by Owner. Provide minimum of two gallons of each system component and color used.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Tnemec.

B. Sherwin Williams.

2.2 MATERIALS

A. Coatings shall meet surface burning characteristics as required by code and established by ASTM E84.

B. Coating products of Tnemec or Sherwin Williams, listed in the Coating Schedule, are set as a standard of quality. Coatings of substitute manufacturers shall meet or exceed the characteristics of the products listed as established by the following ASTM standards; B117, C307, C413, C579, C580, C868, D870, D1014, D1653, D2047, D2240, D2370, D2794, D3363, D4060, D4141, D4541, D4585, D4587, and G85.

C. The Contractor and top coat coating manufacturer shall verify the compatibility of their products with the various primers used on shop primed materials and equipment.

2.3 COLORS

A. Color shall be formed of pigments free of lead, lead compounds, or other materials which might be affected by presence of hydrogen sulfide or other gases likely to be present at Site.

B. Colors shall be as selected by Owner. System color-coding shall be as specified in Section 01080.

C. In areas scheduled for finishing, coat exposed piping, conduit, and ducts to match color of adjacent or near surfaces, except for color-coding.

D. In areas where existing surfaces are finished, coat new exposed piping, conduit, and ducts to match color of adjacent or near surfaces, except for color-coding.

2.4 THINNING, MIXING, AND TINTING

A. Where thinning is necessary, only the products of the manufacturer furnishing the coating will be allowed. All such thinning shall be done in strict accordance with coating manufacturer’s recommendations.

B. Mix in accordance with manufacturer’s recommendations.

C. Each coat shall be slightly darker than preceding coat, unless otherwise noted. Tint undercoats similar to finish coat.

PART 3 PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine the areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Materials removed and replaced to correct defects due to Work placed on unsuitable surfaces shall be at Contractor's expense.

3.2 SURFACE PREPARATION

A. All surfaces to be coated shall be prepared as specified herein and in accordance with coating manufacturer's recommendations. The object shall be to obtain a uniform, clean, and dry surface.

B. Quality of surface preparation described herein is considered a minimum. If coating manufacturer requires a higher degree of preparation, comply with coating manufacturer's recommendations.

C. Where surface dryness is questioned, test with dampness indicating instrument. Do not apply coatings over surfaces where moisture content exceeds that permitted by coating manufacturer.

D. Shop primed surfaces shall be scarified before applying top coats. Conform to top coat manufacturers recommendations.

E. If recoat time between application of primer and second coat or between top coats is exceeded, scarify surface before applying coatings. Conform to top coat manufacturers recommendations.

F. Workmanship for surface preparation shall conform to the following SSPC specifications:
   a. Solvent Clean: SP-1.
   b. Hand Tool Cleaning: SP-2.
   c. Power Tool Cleaning: SP-3.
   d. White Metal Blast Cleaning: SP-5.
   e. Commercial Blast Cleaning: SP-6.
   f. Near-White Blast Cleaning: SP-10.

G. Ferrous Metal:
   1. Ferrous metal primed in the shop shall have all rust, dust, scale, and other foreign substances removed by abrasive cleaning conforming to SSPC SP-10. Cleaned metal shall be primed or pretreated immediately after cleaning to prevent new rusting.
   2. Ferrous metal not primed in the shop shall be abrasive blast cleaned in the field prior to application of primer, pretreatment, or coating. Blast cleaning shall conform to SSPC
      SP-10 for submerged service. Blast cleaning shall conform to SSPC SP-6 for non-submerged service.

3. Prior to finish coating, primed areas that are damaged shall be cleaned and spot primed.

3.3 APPLICATION

A. Surfaces shall be dry at time of application.

B. The minimum surface temperature shall be 55°F and rising. Some coatings are modified so that they may be applied at lower temperatures, conform to manufacturer's recommendations.

C. Apply in strict accordance with manufacturer's recommendations by brush, roller, spray, or other application method. The number of coats and thickness required is the same regardless of application method.

D. Each coat shall be allowed to dry in accordance with manufacturer's requirements. Drying time shall be construed to mean "under normal conditions". Where conditions other than normal exist, because of weather or because of confined space, longer times will be necessary. Units shall not be put in service until coatings are thoroughly dry and cured.

E. Surfaces to be coated that will be inaccessible in the completed work shall receive the final coat before enclosure.

F. Coatings shall be applied to provide an opaque, smooth surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, or other surface imperfections will not be acceptable. Areas cut-in by brush prior to rolling shall have uniform appearance in comparison with adjoining surfaces.

G. Make edges of coating adjoining other materials or colors sharp and clean without overlapping.

H. Crevices and other hard-to-apply areas shall be back-rolled/back-brushed in conjunction with application of field applied prime coat or intermediate coat. This includes, but is not limited to: between pipe flanges, pipe flange/barrel joints, equipment fittings, and other narrow openings.

I. Finish edges of doors as specified for faces. Apply first finish coat on edges before fitting. After doors fitted and hung apply second finish coat.

J. Manufacturer-Applied Coatings:
1. Repair abraded areas on factory-finished items in accordance with equipment manufacturer's recommendations.
2. Blend repaired areas into original finish.

3.4 FIELD QUALITY CONTROL

A. Examination of Work on Site by coating manufacturer's representative shall be performed when requested by Engineer.

B. Sampling of Materials:
   1. Engineer reserves the right to select unopened containers of materials furnished for the Project and have the materials tested at an independent laboratory. Owner will pay for first tests.
   2. Retests of rejected materials and tests of replacement materials shall be paid for by Contractor.
   3. Remainder of contents of containers not required for testing will be returned to Contractor.

C. Coverage:
   1. 1. Before beginning Work, finish one complete room, space, surface, and item of each color scheme required, showing selected colors, finished texture, material, and workmanship. After approval, sample room, space, surface, and item shall serve as standard for similar Work.
   2. 2. If coverage is not acceptable to Engineer, Engineer reserves the right to require additional application of coating at no extra cost to Owner.

D. Where coatings are to be applied at the Site, Engineer reserves the right to observe the Work. After surface has been prepared and before application of specified prime coat and each succeeding finish coat, Contractor shall provide three days notice to Engineer to allow the Engineer time to observe the Work. If notification is not provided, no credit for applied coat will be given and Contractor automatically assumes responsibility to recoat Work in question. Surfaces coated without notification shall be abrasive blast cleaned, re-prepared, and recoated at no addition cost to Owner.

3.5 FINAL TOUCH-UP AND CLEANING

A. Prior to Substantial completion, examine coated surfaces and retouch or refinish surfaces to leave in condition acceptable to Engineer.

B. Remove masking, coatings, and other material from floors, glass, and other surfaces not scheduled to be coated.

3.6 COATING SCHEDULE

A. Scheduled thickness or coverage rate is minimum as recommended by Tnemec. If other manufacturer is used, manufacturer's recommendations shall be followed, but in no case shall the thickness or coverage rate be less than scheduled.

B. Coatings shall conform to the following schedule and coating manufacturer's recommendations. Examples of surfaces to be coated may not be all inclusive.

COATINGS SCHEDULE

System No.	Application	Tnemec Coating System	Sherwin Williams Coating System
12	Galvanized Metal, Copper, PVC / Non-Submerged / Interior / Satin	First Coat – Series V69-1255 Beige @ 2 mils DFT, touch-up primer prior to second coat Second Coat – Series V69 @ 3 mils DFT Third Coat – Series V69 @ 3 mils DFT	First Coat – Macropoxy 646 – SW4004 @ 2 mils DFT, touch-up primer prior to second coat Second Coat – Macropoxy 646 @ 3 mils DFT Third Coat – Macropoxy 646 @ 3 mils DFT
13	Galvanized Metal, Copper, PVC / Non-Submerged / Exterior / Gloss	First Coat – Series V69-1255 Beige @ 2 mils DFT, touch-up primer prior to second coat Second Coat – Series V69 @ 3 mils DFT Third Coat – Series 1095 @ 3 mils DFT	First Coat – Macropoxy 646 SW4004 @ 2 mils DFT, touch-up primer prior to second coat Second Coat – Macropoxy 646 @ 3 mils DFT Third Coat – Hi-Solids Polyurethane 250 Gloss @ 3 mils DFT

Foot Notes:

1. Tnemec Series N66HS may be substituted for Series 1.
2. Copper water only – no paint on SCH 40 or 80 PVC

END OF SECTION

SECTION 11321

CHLORINE DIOXIDE GENERATOR SYSTEM – INSTALLATION ONLY

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Installation of the pre-selected Electrochemical Chlorine Dioxide Generator System and associated appurtenances to be supplied by a PureLine.

1.2 RELATED SECTIONS

A. Division 1 – General Conditions

B. Section 01340 – Shop Drawings, Submittals, and Product Data

C. Section 01600 – Materials and Equipment

D. Section 01650 – Starting of Systems

E. Section 01700 – Operation and Maintenance

F. Section 09900 – Coating

G. Section 15060 – Pipe and Pipe Fittings

H. Division 16 – Electrical

1.3 REFERENCES

A. AGMA – American Gear Manufacturers Association

B. ASME – American Society of Mechanical Engineers

C. ASTM – American Society of Testing and Materials

D. ANSI – American National Standards Institute

E. IEEE – Institute of Electrical and Electronics Engineers

F. NEC – National Electrical Code

G. U.L – Underwriters Laboratories

H. AFBMA – Anti-friction Bearing Manufacturers Association

I. AWS – American Welding Society

1.4 QUALITY ASSURANCE

A. Shop drawings and submittals per Section 01340

1.5 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of Section 01730

B. Operation Data: Include manufacturer's instructions, description of system operation, start-up data and trouble-shooting check lists, and repair data for the Electrochemical Chlorine Dioxide Generator system and ancillary equipment specific for the City of Louisville.

C. Maintenance Data: Include manufacturer's literature, cleaning procedures replacement parts lists, wiring diagrams, and repair data for compressors and components

1.6 DELIVERY, STORAGE, AND HANDLING

A. In accordance with Section 01600

PART 2 PRODUCTS

2.1 ELECTROCHEMICAL CHLORINE DIOXIDE GENERATOR SYSTEM AND APPURTENANCES

A. Selected System: PureLine HP-40 Chlorine Dioxide Generator
   1. 40 lbs/day ClO2 Capacity

B. Appurtenances listed in Construction Drawings and O&M manual.

PART 3 EXECUTION

3.1 FIELD PREPARATION

A. Finish field preparation and painting shall be performed as specified in Section 09900.

B. Contractor shall correct any painting or finish defects from shipping damage prior to installation.

3.2 INSTALLATION

A. Electrochemical Chlorine Dioxide Generator System
   1. Install in accordance with Manufacturer’s instructions
   2. Eliminate any strain between Electrochemical Chlorine Dioxide Generator System and attached feed or drain piping
   3. Correct any misalignment, noisy operation, or other signs of improper setting
   4. Provide all necessary lubrication for initial start-up, testing and final acceptance

5. Anchor equipment foundation according to Manufacturer's bolt pattern and specifications.
6. Install all components in accordance with Manufacturer's instructions and per Construction Drawings

B. Electrical and Controls
1. Install all electrical interconnections between Electrochemical Chlorine Dioxide Generator System control panel and associated equipment per Manufacturer's instructions

C. Piping and Valves
1. Install all interconnecting piping and valves per Section 15060, Section 15100, and as shown on the Construction Drawings

3.3 MANUFACTURER'S FIELD SERVICES

A. Provide under provisions of Sections 01400 and 01700

B. Prior to start-up:
1. Test all valves, switches, and gages for proper settings and operation
2. Check completion of all electrical connections
3. Check assembly alignment
4. Check to ensure all rotational parts are properly lubricated
5. Bump motors to check direction or rotation
6. Direct Contractor in necessarily corrections for start-up
7. Provide written approval for start-up when system is satisfactory

3.4 SYSTEM INSPECTION AND START-UP

A. Start-up shall be in accordance with Manufacturer's instructions.

B. Contractor shall refrain from any equipment start-up prior to Manufacturer's inspection

C. Contractor to coordinate all Manufacturer's field services with Owner and Engineer

D. Contractor shall notify the Owner, Engineer, and Manufacturer upon completion of installation or readiness of equipment for testing and inspection a minimum of 10 days prior

E. Contractor shall perform any necessary correction identified by Manufacturer, Owner, or Engineer after inspection and prior to start-up

3.5 PERFORMANCE TESTS

A. The performance test shall consist of two tests that shall last four hours each. Samples shall be collected at the end of every hour. Both tests shall be averaged, and the installed equipment shall demonstrate that it can meet or exceed the specified Performance Criteria.

B. Any components of the pressure in the Electrochemical Chlorine Dioxide Generator System that fail to meet specifications to the Engineer's satisfaction shall be corrected and re-tested by Contractor

C. A test log shall be submitted to Engineer and Owner upon completion of each test. In addition to the manufacturer specified start up tests; performance tests shall record the following:
   1. Electrochemical Chlorine Dioxide Generator System and all ancillary equipment model numbers and facility tag ID
   2. Serial number
   3. Date of testing with time of testing on that day (start and end)
   4. Motor hp and speed, feed rate, water temperature
   5. All other performance documentation parameters specified herein

3.6 MANUFACTURER'S CERTIFICATION

A. Contractor shall provide any necessary testing certifications per Division 1.

END OF SECTION

SECTION 15060

PIPE AND PIPE FITTINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Piping complete with all fittings, jointing materials, expansion joints, hangers, supports anchors and necessary appurtenances for interior installations:
   1. Potable Water
   2. Chemical Solution
      i) Sodium Chlorite
      ii) Chlorine Dioxide

1.2 RELATED SECTIONS

A. Section 11321 – Electrochemical Chlorine Dioxide Generator System Installation Only

B. Section 09900 – Coatings

1.3 REFERENCES

A. American National Standards Institute (ANSI)
   1. B1.1 – Unified Inch Screw Threads
   2. B16.1/B16.5 – Pipe Flanges and Fittings Package
   3. B16.24 – Cast Copper Alloy Pipe Flanges and Flanges Fittings
   4. B16.26 – Cast Copper Alloy Fittings for Flared Copper Tubes
   5. B18.2 – Square, Hex, Heavy Hex, and Askew Head Bolts and Hex, Heavy Hex, Hex Flange, Lobed Head, and Lag Screws (Inch Series)
   6. B31.1/B31.3 – Power and Process Piping Package

B. American Society of Mechanical Engineers (ASME)
   1. B16.18 – Cast Copper Alloy Solder Joint Pressure Fittings
   2. B16.22 – Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings
   3. B16.26 – Cast Copper Alloy Fittings for Flared Copper Tubes

C. American Society of Testing and Materials (ASTM)
   1. A53/A53M – Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
   2. A134 – Standard Specification for Pipe, Steel, Electric-Fusion (Arc)-Welded (Sizes NPS 16 and Over)
   3. A135 – Standard Specification for Electric-Resistance-Welded Steel Pipe
   4. A139 – Standard Specification for Electric-Fusion (Arc)-Welded Steel Pipe (NPS 4 and Over)
   5. A181 – Standard Specification for Carbon Steel Forgings for General-Purpose Piping

6. A193 – Standard Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications
7. A194 – Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High Pressure or High Temperature Service, or Both
8. A234 – Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service
9. A269 – Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service
10. A283 – Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates
11. A307 – Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength
12. A312 – Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes
13. A325 – Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
14. A774 – Standard Specification for As-Welded Wrought Austenitic Stainless Steel Fitting for General Corrosive Service at Low and Moderate Temperatures
15. A778 – Standard Specification for Welded, Unannealed Austenitic Stainless Steel Tubular Products
16. A795 – Standard Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use
17. B32 – Standard Specification for Solder Metal
18. B75 – Standard Specification for Seamless Copper Tube
19. B88 – Standard Specification for Seamless Copper Water Tube
20. D1785 – Standard Specification for Poly Vinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80, and 120
21. D2464 – Standard Specification for Threaded Poly Vinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 80
22. D2466 – Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40
23. D2467 – Standard Specification for Poly Vinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 80
24. D2996 – Standard Specification for Filament-Wound “Fiberglass” (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe
25. D3035 – Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR.) Based on Controlled Outside Diameter
26. D3139 – Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
27. D3261 – Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing
28. D3350 – Standard Specification for Polyethylene Plastics Pipe and Fitting Materials
29. F104 – Standard Classification System for Nonmetallic Gasket Materials
30. F412 – Standard Terminology Relating to Plastic Piping Systems
31. F477 – Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe

32. F714 – Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Outside Diameter
33. F2164 – Standard Practice for Field Leak Testing of Polyethylene (PE) and Crosslinked Polyethylene (PEX) Pressure Piping Systems Using Hydrostatic Pressure

D. American Water Works Association (AWWA)
1. C110 – American National Standard for Ductile-Iron and Gray-Iron Fittings, 3-Inch through 48-Inch, for Water
2. C111 – Standard for Rubber Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
3. C115 – Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges
4. C150 – American National Standard for Thickness Design of Ductile-Iron Pipe
5. C151 – Standard for Ductile Iron Pipe, Centrifugally Cast, for Water
6. C153 – Standard for Ductile-Iron Compact Fittings
7. C200 – Standard for Steel Water Pipe 6 Inch and Larger
8. C203 – Standard for Coal-Tar Protective Coatings and Linings for Steel Water Pipelines – Enamel and Tape – Hot Applied
9. C206 – Standard for Field Welding of Steel Water Pipe
10. C207 – Standard for Steel Pipe Flanges for Waterworks Service – Sizes 4 Inch Through 144 Inch
11. C209 – Cold-Applied Tape Coatings for the Exterior of Special Sections, Connections, and Fittings for Steel Water Pipelines
12. C219 – Bolted, Sleeve-Type Couplings for Plain-End Pipe
13. C220 – Standard for Stainless Steel Pipe ½ Inch and Larger
14. C606 – Standard for Grooved and Shouldered Joints
15. C900 – Standard for Polyvinyl Chloride (PVC) Pressure Pipe, 4 Inch through 12 Inch, for Water Transmission and Distribution
16. C901 – Standard for Polyethylene (PE) Pressure Pipe and Tubing, 1/2 In. through 3 In., for Water Service
17. C906 – Polyethylene (PE) Pressure Pipe and Fittings 4 Inch Through 63 Inch, for Water Distribution and Transmission
18. C907 – Injection-Molded Polyvinyl Chloride (PVC) Pressure Fittings, 4 Inch through 12 Inch, for Water, Wastewater, and Reclaimed Water Service
19. C950 – Standard for Fiberglass Pressure Pipe
20. M11 – Steel Pipe: A Guide for Design and Installation
21. M23 – PVC Pipe Design and Installation
22. M41 – Ductile-Iron Pipe and Fittings
23. M45 – Fiberglass Pipe Design

E. National Science Foundation (NSF)
1. 61 – Drinking Water System Components – Health Effects

1.4 SUBMITTALS

A. Submit under provisions of Section 01340

B. Shop Drawings:
    1. Provide piping layout fabrication and assembly drawings with fittings dimensions. Provide sufficient information to verify compliance with specification including, but not limited to, the following:
    a. Layout of pipe drawings
    b. Pipe and joint details
    c. Specials, fittings, and coupling details
    d. Specification data sheets
    e. Certificates of compliance with applicable standard and specification and testing certificates
    f. For steel pipe show weld locations and installation of pipe, fittings, specials and connections
        i) Complete data of materials proposed
        ii) Do not manufacture until approved
        iii) Show where each numbered pipe fitting or special is to be installed
        iv) Numbers correspond to those painted on pipe
    2. Provide additional detailed information including elevations, fittings, specialty materials or fabrications for special or custom features, structures, junctions and/or pipes
    3. Specifications, data sheets and affidavits of compliance for coatings and linings
    4. Provide pipe-laying and installation schedule

C. Product Data: Provide sufficient data on features, pipe, joints, gasket material, lubricant and accessories to verify compliance with specifications

D. Manufacturers Certificate and affidavits:
    1. Furnish the following prior to fabrication
    a. Details: Pipe, joint, special, fitting and coupling
    b. Shop coating
    c. Shop coatings and linings: specifications, data sheets, and compliance affidavits
    2. Furnish the following prior to shipment
    a. Compliance affidavit for applicable standards
    b. Test certificates

E. Test Reports: Submit all shop and field test reports in accordance with Division 1 Specifications as Product Data

1.5 PROJECT RECORD DOCUMENTS

A. Submit under provisions of Division 1 Specifications

B. Accurately record actual locations of piping, valves, connections, centerline of pressure pipe elevations, and top of gravity pipe elevations Identify and describe unexpected variations to building conditions or discovery of unknown utilities

1.6 REGULATORY REQUIREMENTS

A. In accordance with all local codes and ordinances, laws and regulations of the State

B. In case of apparent conflict, State and local requirements govern over these specifications

C. In absence of State and local regulations, International Plumbing Code applies

1.7 DELIVERY, STORAGE AND HANDLING

A. For steel pipe with coal tar enamel or hot applied tape: comply with AWWA C203
   1. Handling and Storage:
   a. Use wide canvas slings and wide padded skids.
   b. Do not use bare cables, chains, hooks, metal bars, or narrow skids
   c. Do not store directly on ground, provide proper blocking
   d. Do not roll on enameled or taped surface
   e. Do not expose enameled pipe to temperature below 0 Degrees F
   f. Do not handle enameled pipe below 10 Degrees F
   2. Shipment
   a. Ship steel pipe supported on padded saddles not less than 12-inches wide, securely fasten load to prevent movement in transit. For pipes coated with fusion bonded epoxy use nylon straps
   b. Laterally support ends of pipe, fittings, special, to maintain shape during shipment
   c. Separate materials during shipment to prevent materials bearing against each other
   3. Delivery
   a. Products with dents, kinks, abrupt changes of curvature or other damage shall be rejected upon delivery
   b. Products dropped from truck or crane shall be rejected
   c. Rejected items shall be replaced or reconditioned at the expense of the contractor. Reconditioning shall only be permitted at approval of Engineer and with replacement coatings as originally specified on the reconditioned pipe

B. For all other pipe
   1. Deliver, store, protect and handle products to site under provisions of Division 1 Specifications
   2. Delivery
   a. Ship rubber gaskets in cartons and store in a clean area away from grease, oil, ozone producing electric motors, heat and the direct sunlight
   3. Storage
   a. Store pipe, fittings and gaskets in clean locations protected from environmental conditions such as: direct sunlight, mud, etc.
   b. Do not use pipe and fittings stored in direct sunlight for periods in excess of 18 months
   c. Store pipe on a flat surface which provides even support for the barrel with bell ends overhanging
   d. Do not stack pipe higher than 5 feet
   4. Storage: Use the following precautions for valves, during storage:
   a. Do not remove end protectors unless necessary for inspection; then reinstall for storage
      i) Protect valves from weather by storing indoors or support valves off ground and pavement in watertight enclosures when outdoor storage is necessary

5. Handling
a. Handle so as to insure installation in sound undamaged condition
b. Use equipment, tools and methods for unloading, reloading, hauling and laying that do not damage pipe or cause an impact. Damaged pipe will be cause for rejection
c. Use hooks or straps with broad, well padded contact surfaces for lifting sections of pipe
6. Preparation for Transport:
a. Prepare valves, for shipping as follows:
i) Ensure that valves and pilotry are drained and dry and internally protected against rust and corrosion. Protect valves against damage to threaded ends, flange faces, and weld ends. Set valves in best position for handling. Set valves closed to prevent rattling
7. Deliver and store valves and accessories in shipping containers with labeling in place in accordance with AWWA C500/C504/C509
8. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation
9. Seal pipe and fittings to prevent entry of foreign materials into pipe and fittings
10. During loading, transporting and unloading, exercise care to prevent damage to material
a. Use nylon slings only
b. Do not drop pipe or fittings
c. Do not roll or skid against pipe already on ground
d. Repair any damage done to coating or lining
e. Handle per manufacturer's recommendations
f. Store rubber gaskets in cool dark location
g. Store all material on wood pallets or timbers
11. Adequately tag or otherwise mark all piping and fittings as to size

PART 2 PROCESS PIPING PRODUCTS

2.1 PVC PIPING

A. The following piping shall be PVC pipe as indicated on Drawings and provided for locations specified herein:
1. Chemical service
a. Interior, pressure pipe
2. Drain, waste, vent, and carrier pipe
a. Interior, non-pressure pipe
3. Contractor shall submit complete process piping Drawings and shall include all location and dimensions of piping, fittings, valves, and couplings

B. PVC Process Piping (Pressure)
1. The following piping shall be pressure PVC pipe as indicated on the drawings and as specified herein:
2. As indicated in Piping Schedule below
3. Manufacturers:

a. Cresline Plastic Pipe Co.
b. North American Pipe Corp.
c. Spears Manufacturing Co.
d. Or accepted substitution

4. Pipe and fittings:
5. 1/2 inch to 12 inch, ASTM D1785 [verify size of pipe required for project]
   a. Pipe shall have cast iron pipe equivalent outside diameters
   b. Schedule 40 or 80
6. Fittings: Comply with ASTM D2466 (Schedule 40) or ASTM D2467 (Schedule 80)
7. Joints:
   a. Shall be bell and spigot, push-on type suitable for solvent welding, threading, or flanging
   b. Flanges: Diameter and drilling per ANSA B16.5, 150 lbs
   c. Flange bolts and nuts: ASTM A307, Grade B, galvanized, install such that bolts project 1/8-inch to 3/8-inch beyond the outer face of the nut
   d. Flange gaskets: Full face, minimum 1/8-inch neoprene or plasticized PVC and shall be in conformance with ASTM F104 and F477
8. Designed to hold pipe in alignment, provide flexibility, separate the ends of pipe lengths, resist applied pressures, and provide fluid tightness
9. Solvent welding: ASTM D2672
10. Use recommended solvent primer and cement for the application of fluid to be conveyed in pipeline
11. Provide for sleeves or couplings where indicated.
    a. Expansion joint manufacturers:
       i) Resistoflex "Style R6905"
       ii) Flexicraft “Style TEFLEX-C3’
       iii) Or accepted substitution
    b. Grooved couplings:
       i) Victaulic “Style 75” Style 77” “Style 741” "Style 78"
       ii) Or accepted substitution
12. Furnish pipe ends suitable for receiving style of sleeve or coupling indicated or specified.
13. Provide anchoring where restraint is required to withstand specified operating or hydrostatic test pressure and where indicated

C. PVC Drain, Waste, Vent, or Carrier Pipe (Non-Pressure)
1. Pipe and fittings: Schedule 40 in accordance with ASTM D2466, ASTM D2122, F412
2. Joints:
   a. Solvent weld per manufacturer’s recommendation
   b. Threaded: ANSI 82.1

2.2 HIGH DENSITY POLYETHYLENE (HDPE) PESSURE PIPING

A. HDPE pipe shall be as indicated on the drawings and specified herein:
1. As indicated in Piping Schedule below

B. Manufacturers:
1. Performance Pipe

2. WL Plastics
3. ISCO Pipe
4. Or accepted substitution

C. Material
1. The pipe shall be manufactured from a PE 4710 resin compound listed with the Plastic Pipe Institute (PPI) as TR-4.
2. The resin material shall be in accordance with ASTM D3350 with a minimum cell classification of 445574C/E.
3. This resin material shall have a Long Term Hydrostatic Strength of 1600 PSI when tested in accordance to ASTM D2837.
4. Pipe dimensions shall be in accordance with ASTM D3035 as a minimum.
5. The final compounded material shall contain a minimum of 2% carbon black
6. The pipe shall contain no recycled material except that generated by the pipe manufacturer in their own plant from resin compound of the same specification and raw material supplier. The pipe shall be homogeneous throughout and free of visible cracks, holes, foreign inclusions, voids, or other injurious defects.
7. Pipe shall have a manufacturing standard of ASTM F714 and be manufactured by an ISO 9001 certified manufacturer.
8. All pipes and fittings shall be suitable for use as pressure conduits, listed as NSF 14, and per AWWA C906 Pressure Class (PC) 100 have a nominal burst value of three and one-half times the Working Pressure Rating (WPR) of the pipe and/or fitting
9. The pipe shall be DR11 unless noted otherwise on the Drawings

D. Fittings
1. All fittings shall be PE 4710 HDPE, minimum Cell Classification of 445574C/E as determined by ASTM D3350, and approved for AWWA use.
2. All fittings shall be of the same base resin as the pipe.
3. All fittings shall have a working pressure rating equal to the pipe unless otherwise specified in the plans.
4. All fittings shall be homogeneous throughout and free of visible cracks, holes, foreign inclusions, voids, or other injurious defects.
5. Butt Fusion Fittings
    a. Molded butt fusion fittings shall be in accordance with ASTM D3261 and shall be manufactured by injection molding, a combination of extrusion and machining, or fabricated from HDPE pipe conforming to this specification.
6. Compression Type Mechanical Coupling
    a. Suitable for joining HDPE to HDPE, HDPE to PVC, or HDPE to DIP
    b. Factory coat coupling internally and externally with a fusion bonded epoxy
    c. Reinforce HDPE pipe with a split ring type stiffener in pipe bore
        i) Size stiffeners for size of HDPE pipe being joined
        ii) Supply feature that prevents stiffener from sliding completely into pipe
        iii) Size stiffeners for length of mechanical coupling and not to extend outside of body of mechanical coupling
        iv) Mark stiffener with pipe diameter
        v) Factory coat stiffeners internally and externally with fusion bonded epoxy
    d. Use seal and restraint type coupling. Requirements for type of couplings are specified herein or shown on Drawings

i) Approved Manufacturers:
   a) JCM Industries
   b) Agru America
   c) Romac Industries
   d) Or accepted substitution

E. Transition Couplings: One piece assembly
   1. One end being HDPE pipe with butt fusion joining technique
   2. Other end being either steel or brass pipe threaded suitable for connecting ductile iron, threaded fittings, or threaded valves
      a. Approved Manufacturers:
         i) Central Plastics Company
         ii) Industrial Pipe Fittings, Inc.
         iii) Or accepted substitution

F. Pipe fittings and flanged connections, to be joined by thermal butt-fusion, shall be of the same type, grade, and class of polyethylene compound and supplied from the same raw material supplier.

G. Sidewall fusions for connections to outlet piping shall be performed in accordance with HDPE pipe and fitting manufacturer's specifications. The heating irons used for sidewall fusion shall have an inside diameter equal to the outside diameter of the HDPE pipe being fused. The size of the heating iron shall be ¼ inch larger than the size of the outlet branch being fused.

H. Socket fusion, hot gas fusion, threading, solvents, and epoxies will not be used to join HDPE pipe

I. Flange Gaskets
   1. Flange gaskets shall be full-faced and shall be in accordance with ASTM D1330
   2. Flange gasket drilling pattern shall conform to ANSI B16.1/B16.5
   3. Flange gaskets shall be 1/16" thick for flanges up to 14" diameter. 1/8" thick gaskets shall be provided for flanges over 14" diameter

J. Gasket material shall be EPDM

2.3 TUBING

A. Provide 3/8 inch polypropylene resin tubing sufficient in length for transport of chemical from each metering pump to application point
   1. Natural translucent
   2. 0.062 inch wall thickness
   3. Pressure: 172 psi (at 73ºF)

B. Manufacturers:
   1. Ryan Herco Flow Solutions "Herco-Pro Polypropylene Tubing"
   2. Or accepted substitution

2.4 COPPER TUBING

A. The following piping shall be copper pipe provided for locations specified herein:
   1. Potable Water
   a. Interior, pressure pipe

B. Water tubing: ASTM B88, Type L, for exposed service

C. Instrument tubing
   1. Provide 1/2-inch copper tubing for air valve actuation piping
   2. Material: ASTM B75, hard-drawn
   3. Minimum wall thickness
   a. ¼ inch O.D.: 0.030 inches
   b. ⅜ inch O.D.: 0.032 inches
   c. ½ inch O.D.: 0.032 inches
   d. ¾ inch O.D.: 0.040 inches
   e. Minimum PVC jacket thickness: 0.032 inches
   4. Air instrument piping shall be painted in accordance with Section 09900

D. Fittings
   1. Flared: ASME B16.26
   2. Solder: ASME B16.18 or B16.22
   3. Compression:
   a. Crawford “Swagelok”
   b. Hoke “Gryolok”
   c. Imperial “Hi-Seal”
   d. Parker-Hannifin “CPI”
   e. Weatherhead “Self Align”
   f. Or accepted substitution
   4. Insulating
   a. Threaded:
      i) PSI “Delrin Insulating Couplings”
      ii) Vallet “V-Line Insulating Couplings”
      iii) Or accepted substitution
   b. Flanged:
      i) Epco “Dielectric Flange Unions”
   c. PSI “Type E Flange Insulation”
   d. Or accepted substitution

E. Solder: Solid wire, ASTM B32, Alloy Grade SN95 Lead Free Solder

F. Soldering flux: Paste Type, ASTM B813

G. Brazing filler metal: ASTM C260, BCuP
   1. Engelhard “Silvaloy 15”
   2. Goldsmith “gb-15”
   3. Handy and Hardman “Sil-Foss”
   4. Or accepted substitution

H. Brazing flux: Paste Type, AWS Standard A5.31, Type FB3-A or FB3-C

I. Flanges: Cast bronze, 150 lb, brazed joints, ASME B16.24

J. Flange bolts and nuts: As specified for steel pipe

K. Flange gaskets: As specified for steel pipe, except full face

L. Expansion joints
   1. Flexonics “Model HB Expansion Compensators”
   2. Mercer
   3. Or accepted substitution

PART 3 EXECUTION

3.1 INSTALLATION

A. Install as specified and indicated on Drawings

B. Remove dirt, rocks, debris, and other foreign materials from all pipelines

C. Keep interior of pipe and fittings thoroughly clean before installation and until work is accepted

D. Take precautions to prevent entrance of foreign material during jointing, lining repair, and inspection operation

E. Seal open end of line with watertight plug if pipe laying stopped

F. Provide and install sufficient copper tubing to run instrument air to all pneumatic actuators

G. Provide a shutoff valve and union at the water and air supply connections to each fixture and unit of equipment, whether shown on the Drawings or not

H. Provide a union within 2 feet of each threaded end valve unless other means for easy removal of the valve are available

I. Provide unions where required for equipment removal, indicated on the Drawing or specified

J. Do not install piping to obstruct openings and passageways

K. Cut pipe to measurement taken at the site, not from the Drawings

L. Layout piping to provide for expansion and contraction

M. Provide taps for pressure gauge connections with a nipple, snubber, and gauge cock

N. Securely anchor piping at the midpoints between expansion joints

O. Provide air supply piping with sectionalizing valves and valved air inlet connections to isolate portions of system for periodic testing

P. Grade all air piping to points of drainage; provide driplegs on drain valves at drainage points

Q. Uniformly grade all piping serving metering equipment and provide complete venting to eliminate air traps

R. Pipe stuffing box leakage from water sealed pumps to nearest point of drainage

S. Provide insulating fittings and dielectric isolation in all piping except air and gas piping wherever copper tubing or fittings are connected to iron or steel pipe or fittings

T. Provide expansion joints at not greater than 60-foot intervals in exposed or submerged piping

3.2 CONNECTION TO EXISTING PIPELINES

A. Make connections between new and existing piping with suitable fittings

B. Schedule connection to minimize inconvenience to the Owner

C. Undertake connections in order to disturb the system as little as possible

D. Where connection involves potable water systems, provide disinfection methods as prescribed in these Specifications

E. Once tie in to existing system is initiated, continue Work continuously until tie-in is made and tested

3.3 JOINTS

A. Make pipe joints carefully and neatly

B. Connect piping in accordance with manufacturer recommendations

C. Threaded
   1. ANSI B2.1, NPT fully and cleanly cut with sharp dies
   2. No more than 3 threads exposed after installation
   3. Ream pipe ends after threading to remove burrs
   4. Apply Teflon thread tape to joints in all plastic and stainless steel piping
   5. Apply thread tape or joint compound to joints in other piping
   6. Apply Teflon thread tape or litharage and glycerine paste to joints on steel piping for chlorine service

D. Compression
   1. Cut pipe ends squarely, remove burrs
   2. Clean contact surfaces with steel wool

E. Flared
    1. Cut tubing ends squarely, remove burrs
    2. Scratches or grooves in flared ends are not allowed

F. Soldered and brazed
    1. Braze joints in 2 inch or larger copper tubing
    2. Solder or braze lines smaller than 2 inch where solder fittings are specified
    3. Thoroughly clean joint surfaces with flint paper and coat with thin film of flux
    4. Install tubing to full depth of socket
    5. Do not overheat metal or flux
    6. Uniformly heat joint to melt filler metal on contact
    7. Remove surplus filler metal and flux while joint is still hot

G. Solvent welded
    1. Cut PVC pipe ends square and smooth, wipe clean
    2. Remove all burrs and filings
    3. Using a small brush, apply cement primer to the outside of pipe and the inside of the fitting socket
    4. Using a small brush, apply solvent cement to outside of pipe and inside of the fitting socket
    a. Solvent cement to be specifically rated for use with chlorine or hypochlorite solutions for piping and fittings that will be used to convey these solutions
    5. To ensure uniform cement distribution, push the coated surface snugly together and rotate approximately 1/2 turn
    6. Remove excess cement by wiping

H. Grooved couplings
    1. Cut grooves with grooving tool
    2. Groove to rigid grooving dimensions
    3. Groove cleanly and sharply without burrs or check marks
    4. Form rounded bottom "radius grooves" in plastic piping

I. Welded: ANSI B31.1, and per applicable Standards for pressure piping

J. Push on
    1. Per recommendations of pipe manufacturer
    2. Bevel each spigot end to facilitate assembly
    3. Lubricate with a heavy vegetable soap solution immediately before joint is completed
    4. Store lubricant in closed containers, keep clean, suitable for use in potable water contact

K. Mechanical Joints
    1. If an effective seal is not obtained, disassemble joint, clean thoroughly, and reassemble
    2. Do not over tighten bolts to compensate for poor installation
    3. Carefully align holes in mechanical joints with restraint device to permit installation of the harness bolts

4. Install flange and mechanical joint pieces so the four mechanical joint holes, as well as the flange holes, straddle the top centerline for horizontal piping, or the side centerline for vertical piping

L. Flanged joints
   1. Take care when bolting flanges to insure that there is no restraint on the opposite end of the pipe which would prevent gasket compression or cause unnecessary stress in flanges
   2. Leave one flange free to move in any direction while tightening flange bolts
   3. Do not pack or assemble bell and spigot joints until all flanges affected thereby have been tightened
   4. Tighten bolts gradually at a uniform rate to compress gaskets uniformly

3.4 COPPER PIPING

A. Install in a neat, workmanship like manner.

B. Follow guidelines of the Copper Tube Handbook and industry practice.

3.5 CHEMICAL PIPING

A. Install so that the lines are readily accessible for cleaning

B. At each point where flexible tubing is connected to rigid piping, provide a union or quick disconnect coupling

C. Provide crosses with threaded plugged openings at changes in direction

3.6 CLEANING

A. General
   1. The inside of all pipe, valves, and fittings shall be smooth, clean, and free from blisters, loose mill scale, sand, and dirt when erected
   2. Immediately prior to pressure testing, clean and remove grease, metal cuttings, dirt, or other foreign materials which may have entered the system
   3. Flush or blow all lines thoroughly before placing in service
   4. At completion of Work and prior to final acceptance, thoroughly clean Work installed under these specifications
   a. Clean equipment, fixtures, pipe, valves, and fittings of grease, metal cuttings, and sand and dirt which may have accumulated by operation of system, from testing, of from other causes
   b. Repair any stoppage or discoloration or other damage to parts of building, its finish, or furnishings, due to failure to properly clean piping system, without cost to Owner

3.7 FIELD QUALITY CONTROL

A. General
   1. Utilize pressures, media, and pressure test durations as specified on Piping Schedules

2. Isolate equipment which may be damaged by the specified pressure test conditions
3. Perform pressure test using calibrated pressure gauges and calibrated volumetric measuring equipment to determine leakage rates. Select each gauge so that the specified test pressure falls within the upper half of the gauge range. Notify Engineer 24 hours prior to each test
4. Completely assemble and test new piping systems prior to connection to existing pipe systems
5. Acknowledge satisfactory performance of tests and inspections in writing to Engineer prior to final acceptance
6. Provide all necessary equipment, materials, tools, appliances, devices, and perform all work required in connection with the tests and inspections
7. Bear the cost of all testing and inspecting, locating and remedying of leaks and any necessary retesting and re-examination

B. Pipe leaks
   1. All joints and seams whether tested or not shall be watertight and airtight
   2. Inspect all exposed shop and field welded seams
   3. Leaks shall be clearly marked
   4. Welded joints (steel) shall be repaired by chipping out defective parts and rewelding. Welds shall not be hammered
   5. Leaks discovered by Owner within 2-years of final acceptance shall be repaired by the Contractor at no additional expense to the Owner

C. Test each line at the Contractor's expense in the presence and to the satisfaction of Engineer

D. General testing methods and criteria
   1. Liquid systems
   a. The following liquid piping systems shall have zero allowable leakage at the specified test pressure throughout the specified duration of 2 hours: exposed piping and buried or exposed piping carrying liquid chemicals or water
   b. Hydrostatic pressure testing
      i) For exposed piping: Prepare each section for testing, using adequate bracing and protect system equipment susceptible to damage by test pressures. Do not paint or insulate exposed piping until successful performance of pressure test.

3.8 DISINFECTION OF WATER PIPING SYSTEM

A. After favorable performance of pressure test and prior to final acceptance, thoroughly flush entire water piping system, including supply, source and any appurtenant devices and perform disinfection as prescribed

B. Flush and disinfect each segment of system in accordance with AWWA C651.

END OF SECTION

SECTION 15090

SUPPORTS AND ANCHORS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Pipe and equipment hangers and supports

B. Equipment bases and supports

C. Flashing and sealing equipment

1.2 RELATED SECTIONS

A. Section 03000 – Cast in Place Concrete

B. Section 05590 – Miscellaneous Metal

C. Section 09900 – Coatings

D. Section 15060 – Pipe and Pipe Fittings

1.3 REFERENCES

A. American Society of Testing and Materials (ASTM)
   1. F708 – Design and Installation of Rigid Pipe Hangers

B. International Building Code (IBC)

C. Manufacturers Standardization Society (MSS)
   1. SP58 – Pipe Hangers and Supports – Materials, Design and Manufacturer
   2. SP69 – Pipe Hangers and Supports – Selection and Application
   3. SP89 – Pipe Hangers and Supports – Fabrication and Installation Practices

1.4 SYSTEM DESCRIPTION

A. Provide complete system of pipe supports and anchors for all piping

B. Support all piping to prevent undue strain on any valve, fitting or piece of equipment

C. Provide support and anchors at changes in direction, change in elevation, adjacent to flexible couplings, and where valve actuators/positioners add additional weight and stresses

D. Do not install in equipment access areas

1.5 PERFORMANCE REQUIREMENTS

A. Pipe support system components to withstand total dead load
   1. Dead load: Weight of pipe filled with water plus any insulation
      a. Dead load defined as weight of pipe filled with water plus any insulation
   2. Factor of safety: 5 minimum

B. Pipe restraint system components to withstand thrusts created by fluid pressure within pipes
   1. Factor of safety: 5 minimum

C. Do not exceed manufacturers' recommended loads

D. Brace all piping 2½ inch and larger for Seismic Design Category B forces in accordance with International Building Code

1.6 SUBMITTALS

A. Submit under provisions of Section 01340

B. Shop drawings: Indicate system layout with location and detail of trapeze hangers. Include location of pipe supports

C. Product data: Provide manufacturers catalog data including load capacity

D. Design data: Indicate load carrying capacity of trapeze, multiple pipe, and riser support hangers

E. Manufacturer's installation instructions: Indicate special procedures and assembly of components

PART 2 PRODUCTS

2.1 MATERIALS

A. Not submerged: Galvanized steel except where otherwise indicated or specified

B. Submerged: Stainless steel, 304L

C. Use stainless steel materials for stainless steel pipe or galvanized steel with non-conductive isolation gaskets to prevent electrolytic corrosion

2.2 PIPE HANGERS AND SUPPORTS

A. Manufacturers:
   1. Anvil International
   2. Unistrut Corporation
   3. Elcen Metal Products Co.
   4. PHD Manufacturing, Inc

5. Or accepted substitution

B. Plumbing piping – water:
   1. Conform to requirements of Section 15060
   2. Hangers for pipe sizes ½ to 1½ inch: Stainless steel, adjustable swivel, split ring
   3. Multiple or trapeze hangers: Steel channels with welded spacers and hanger rods
   4. Wall support for pipe sizes to 3 inches: Cast iron hook
   5. Vertical support: Stainless steel riser clamp
   6. Copper pipe support: Stainless steel ring, adjustable, copper plated

2.3 ACCESSORIES

A. Hanger rods: ASTM A307, Grade R. Mild steel threaded both ends, threaded one end, or continuous threaded

B. Isolation pads: neoprene waffle type
   1. Manufacturers: Mason Industries "Type W", Fabreka Production Company "Fabcel", or accepted substitution

C. Insulation protection shield: ANSI/MSS SP-58

2.4 FLASHING

A. Metal flashing: 26 gauge galvanized steel

B. Metal counter flashing: 22 gauge galvanized steel

C. Flexible flashing: 0.125 inch thick sheet butyl-isoprene; compatible with roofing

D. Caps: Steel, 22 gauge minimum

2.5 SLEEVES

A. Sleeves for round ductwork: Galvanized steel

B. Sleeves for rectangular ductwork: Galvanized steel or wood

C. Sealant: Refer to Section 07900

2.6 FINISHING

A. All hangers, rods, clamps, protective shields, metal framing support components, and hanger accessories: Galvanized Steel unless otherwise indicated or specified

B. For stainless steel components: none required

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer’s instructions

B. Pipe supports and anchors are not indicated on drawings in all locations; supports are indicated for most larger pipes

C. Provide system of pipe supports and anchors for all piping

D. Provide additional supports as required adjacent to couplings

E. Pipe supports shall be provided at all changes in direction and adjacent to flexible couplings

3.2 PIPE HANGERS AND SUPPORTS

A. For designated pipe supports located adjacent to equipment and other locations requiring vibration isolation, provide isolation pad

B. Support horizontal piping as scheduled

C. Install hangers to provide minimum ½ inch space between finished covering and adjacent work

D. Brace all piping 2-1/2 inch and larger for Seismic Design Category B forces in accordance with local building codes

E. Place hangers within 12 inches of each horizontal elbow

F. Use hangers with 1½ inch minimum vertical adjustment

G. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers

H. Support riser piping independently of connected horizontal piping

I. Design hangers for pipe movement without disengagement of supported pipe

J. Piping connections to equipment: Provide pipe support adjacent to equipment. Pipes shall not be supported on equipment

K. Do not support lower pipe from pipe above

L. Support pipe 1½ inch minimum from walls and 3 inch minimum below ceilings

M. From framing strut systems, cut ends and paint exposed metal with galvanized paint

N. Prime coat exposed steel hangers and supports. Refer to Section 09900. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed

O. Do not install pipe supports in equipment access areas

3.3 EQUIPMENT BASES AND SUPPORTS

A. Provide housekeeping pads of concrete, minimum 4 inches thick and extending 6 inches beyond supported equipment. Refer to Drawings for location of pads

B. Provide templates, anchor bolts, and accessories for mounting and anchoring equipment

C. Construct supports of steel members. Brace and fasten with flanges bolted to structure

D. Provide rigid anchors for pipes after vibration isolation components are installed

3.4 FLASHING

A. Provide flexible flashing and metal counterflashing where piping and ductwork penetrate weather or waterproofed walls, floors, and roofs

B. Adjust storm collars tight to pipe with bolts; caulk around top edge. Use storm collars above roof jacks. Screw vertical flange section to face of curb

3.5 SCHEDULES

A. Maximum hanger spacing and rod size for cast iron, ductile iron, steel and PVC:

Pipe size (inches)	**Max. hanger spacing (feet)**	**Hanger rod diameter (inches)**
1½ and smaller	6	3/8
1 ½ to 2	8	3/8 to 1/2
2 ½ to 3	10	1/2 to 5/8
4	10	5/8
6 and 8	12	3/4
10 and 12	14	7/8
14 and16	16	1
18	16	1-1/8
20 and larger	18	1-1/4
PVC (all sizes)	6	Same as for steel

B. Maximum hanger spacing and rod size for copper and stainless steel piping
   1. Spacing:
      a. 1 inch and smaller: 5 feet maximum
      b. 1¼ inch and larger: 2 feet less than maximum spacing for steel pipe of same size
   2. Hanger rod size: Same as for steel

END OF SECTION

SECTION 15100

VALVES, COCKS, AND HYDRANTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Valves indicated on the drawings, specified, or required for proper operation of equipment or systems

1.2 RELATED SECTIONS

A. Section 01340 – Shop Drawings, Product Data, and Samples

B. Section 01600 – Materials and Equipment

C. Section 01730 – Operation and Maintenance Data

D. Section 09900 – Coatings

E. Section 15060 – Pipe and Pipe Fittings

F. Div 16 – Electrical

1.3 REFERENCES

A. American National Standards Institute (ANSI):
1. B16.1 – Cast Iron Pipe Flanges and Flanged Fittings
2. NSF/ANSI 61 – Testing and Certification

B. American Society for Testing and Materials (ASTM):
3. A48 – Standard Specification for Gray Iron Castings
4. A126 – Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings
5. A216 – Standard Specification for Steel Castings, Carbon, Suitable for Fusion Welding, for High-Temperature Service
6. A536 – Standard Specification for Ductile Iron Castings
7. B62 – Standard Specification for Composition Bronze or Ounce Metal Castings

C. American Water Works Association (AWWA):
8. C111 – Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
9. C207 – Steel Pipe Flanges for Waterworks Service, Sizes 4 In. Through 144 In.
10. C500 – Metal-Seated Gate Valves for Water Supply Service
11. C502 – Dry-Barrel Fire Hydrants
12. C503 – Wet-Barrel Fire Hydrants
13. C504 – Rubber Seated Butterfly Valves
14. C508 – Swing-Check Valves for Waterworks Service, 2 In. Through 24 In. NPS

15. C509 – Resilient-Seated Gate Valves for Water Supply Service
16. C510 – Double Check Valve Backflow Prevention Assembly
17. C511 – Reduced-Pressure Principal Backflow Prevention Assembly
18. C512 – Air Release, Air/Vacuum, and Combination Air Valves for Waterworks Service
19. C514 – Air Valve and Vent Inflow Preventer Assemblies for Potable Water Distribution System and Storage Facilities
20. C515 – Reduced-Wall, Resilient-Seated Gate Valves for Water Supply Service
21. C517 – Resilient-Seated Cast-Iron Eccentric Plug Valves
22. C518 – Dual-Disc Swing-Check Valves for Waterworks Service
23. C520 – Knife Gate Valves, Sizes 2 In. (50 mm) Through 96 In. (2,400 mm)
24. C530 – Pilot-Operated Control Valves
25. C541 – Hydraulic and Pneumatic Cylinder and Vane-Type Actuators for Valves and Slide Gates
26. C542 – Electric Motor Actuators for Valves and Slide Gates
27. C550 – Protective Interior Coatings for Valves and Hydrants
28. C560 – Cast-Iron Slide Gates
29. C561 – Fabricated Stainless-Steel Slide Gates
30. C562 – Fabricated Aluminum Slide Gates
31. C563 – Fabricated Composite Slide Gates

1.4 SUBMITTALS

A. Submit under provisions of Section 01340

B. Product Data: Provide data on valves and accessories. Provide manufacturer's catalog information with dimensions, materials, and assembled weight. Indicate valve data and pressure ratings

C. Manufacturer's Instructions: Provide complete manufacturer's installation instruction

1.5 PROJECT RECORD DOCUMENTS

A. Record actual size, type and locations of valves

1.6 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of Section 01730

B. Maintenance Data: Include installation instructions, spare parts list, exploded assembly views, maintenance requirements

1.7 QUALITY ASSURANCE

A. Manufacturer's name and pressure rating marked on valve body

1.8 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum 10 years documented experience

1.9 REGULATORY REQUIREMENTS

A. Conform to all municipal codes and ordinances, laws and regulations of the State

B. In case of apparent conflict, State and local requirements govern over these specifications

C. In absence of State and local regulations, International Plumbing Code will apply

D. Comply with Federal 2014 Reduction of Lead in Drinking Water Act with regard to pipe, fixtures, and fittings used to convey water for potable use purposes.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect, and handle products to site under provisions of Section 01600

B. Prepare valves and accessories for shipment according to AWWA C500

C. Accept valves on site in shipping containers with labeling in place. Inspect for damage

D. Provide temporary protective coating on cast iron and steel valves

E. Seal valve ends to prevent entry of foreign matter into valve body

F. Drain valves and pilotry of water prior to shipping and storage

PART 2 PRODUCTS

2.1 GENERAL

A. Construction
   1. Actual valve length within ± 1/16" of specified or theoretical length
   2. Ends, except as otherwise specified
      a. 3" and smaller, threaded or soldered ends
      b. 4" and larger, flanges, ANSI 125 lb
      c. Wafer style valves designed for installation between ANSI 125 lb flanges

B. Actuators
   1. Manual actuators:
      a. Provide manual actuators for all valves not specified to be power actuated or designed for automatic operation
         1) General use: Handwheel
         2) Seven feet or more above the floor or grade unless otherwise indicated: Chain wheel with operating chain

a) Equipped with chain guide to permit rapid chain handling of the chain without “gagging” the wheel and to permit reasonable side pull on the chain
b) With extensions as required to prevent interference with adjacent piping or equipment
c) Chain heavily zinc or cadmium-plated and looped to extend between 3' and 4' off the floor or grade below valve

b. Rotation
1) Counter clockwise (to the left) to open
2) The word “OPEN” and an arrow indicating the direction to open cast on each valve body or operator
3) Position indicator clearly visible from operating floor

c. Extension stems
1) Provide where indicated on drawings, specified, or required for proper operation
2) Non-rising stems
a) Solid steel shafting with O.D. not less than O.D. of valve stem or galvanized steel pipe with I.D. not less than O.D. of valve stem
b) Connected to the valve by a flexible socket coupling
c) All other connections pinned, keyed, or socket
3) Rising stem
a) Stainless steel or carbon steel shafting with O.D. not less than O.D. of valve stem
b) Bronze or stainless steel sleeves securely attached to stem
c) Sleeve length and location to extend through each stem guide throughout the full vertical travel of the stem

d. Stem guides
1) Cast iron, bronze brushed, adjustable in two directions
2) If extension stem length exceeds 10' or the weight exceeds 50 lbs., design top guide to carry the stem weight and provide a collar on the stem to bear against the thrust guide
3) Max spacing
a) Non-rising stems: 100 times stem O.D.
b) Rising stems: 60 times stem O.D.
c) Ten-foot maximum

e. Operating Stands
1) Provide as indicated on Drawings
2) Fabricated steel or cast iron
3) Support the handwheel or lever approximately 36" above the floor
4) Handwheel diameter: 8" minimum
5) Provide a standard weight galvanized pipe sleeve for opening in the floor
6) For longer than 10' and without stem guides with thrust bearings, provide a suitable thrust bearing in each stand to carry extension stem weight

2. Electric Actuators (Operators)
a. Provide motor actuators as indicated on Drawings
b. Each motor actuator to consist of motor, actuator unit gearing, handwheel, limit and torque switches, mechanical position indicator, lubricants, heating element,

wiring, terminals and integral reversing controller on capacitance starter as indicated, constructed as a self-contained unit

c. Housing: Cast, weatherproof, NEMA 4 unless indicated otherwise
    1) Operating time from fully open to fully closed or the reverse:
    2) For open/close valves: 30 seconds
    3) For modulating valves: adjustable from 15 seconds to two minutes
d. Motors
    1) Mounted horizontally adjacent to or vertically above gearing
    2) Do not mount with motor vertical below gearing
    3) Totally enclosed, high torque, designed expressly for valve operator service
    4) Service rating:
        a) Open/close service motors shall be rated for 15-minute continuous duty
        b) Modulating service motors shall be rated for a minimum of 600 starts/hour
        c) Designed in accordance with NEMA Standards
        d) Insulation: Class F or better
        e) Bearings: Permanently lubricated
        f) Voltage tolerance: +/- 10 percent
        g) Voltage rating: 480 Volt, 60 Hz, 3 phase
        h) Conform to AWWA C542
    5) Gearing
        a) All grease lubricated
        b) Service factor: 2.0
        c) Effectively sealed against entrance of foreign material
        d) AGMA nameplate not required
        e) Supported by anti-friction bearings
    6) Designed so motor comes up to speed before stem load is encountered in opening and closing direction
    7) Self-locking worm gear drive with alloy bronze worm gear and hardened steel worm
    8) Handwheel/Chainwheel mechanism
        a) Designed to handwheel/chainwheel does not operate during motor operation
        b) Designed so motor does not rotate when handwheel/chainwheel is rotated after declutching
        c) Provide declutching extensions to allow declutching of all electric actuators from floor level
        d) Actuator responsive to electrical power and control at all times, instantly disengaging handwheel/chainwheel
        e) Shall meet all requirements for manual actuator
    9) Torque switches
        a) Provide opening and closing torque and thrust limit switches
        b) Micrometer adjustment on each switch
        c) Reference setting indicator
        d) Variability 40 percent
        e) Contact rating: 6 amp inductive at 120 Vac
    10) Geared limit switches
        a) Space for 4 geared limit switch assemblies

b) Each assembly with 2 sets of NO contacts and 2 sets of NC contacts
c) Each assembly geared to driving mechanism and independently adjustable to transfer at any point between fully open and fully closed valve position
d) Contact rating: 6 amp inductive at 120 Vac
e) Provide three limit switch assemblies

11) Heating element
a) Provide in actuator housing
b) Rated 120 Vac
c) Continuously energized

12) Terminal facilities: Provide for connection to motor leads, switches, heating elements, control and power supply

13) Controller
a) Integrally mounted solid state reversing controller for modulating operators, integrally mounted electromechanical controller for open-close operators
b) Motor overload protective device
c) Electrically interlocked
d) Provided with the necessary direct operated auxiliary contacts for required interlocking and control

14) Pilot devices, Modulating Service
a) In a weatherproof enclosure close-coupled to actuator housing
b) Open-stop-close maintained contact push buttons
c) Hand-Auto maintained selector switch
d) Red “Open” and green “Closed” indicating lights
e) Auto position of selector allows 4-20 ma input proportional to required valve position

15) Pilot Devices, Open/Close Service
a) In a weatherproof enclosure close-coupled to actuator housing
b) Local Open/Close maintained pushbuttons
c) Local Hand-Auto maintained selector switch
d) Local red “Open” and green “Closed” indicating light
e) Auto position of selector allows open or close operation from remote un-powered contact from maximum distance of 300 feet

16) NEMA Size 1 minimum

17) Action on loss of command signal shall be selectable to include open, close, or last position

18) Controller for modulating service shall include provisions for zero, span gain, opening and closing speed potentiometer and deadband adjustment

19) Acceptable Manufacturers:
a) Rotork
b) Bray
c) Auma
d) Limitorque

2.2 BUTTERFLY VALVES (WATER AND PROCESS SERVICE)

A. Manufacturers:

1. DeZurik
2. Milliken
3. Val-Matic
4. Or Engineer accepted substitution

B. Valve Design and Conditions
   1. Bi-directional pressure rating: 150 psi for 3 inch through 24 inch valves
   2. Temperature rating: 250°F
   3. Bi-directional and tested to 110% of full rating
   4. Shall be in conformance with AWWA C504 and C542
   5. Conform to Valve Schedule in this section
   6. Valve ends:
      a. Shall be ANSI B16.1 Class 125 for cast-iron body valves Class 25A through Class 150B
      b. Shall be ANSI B16.1 Class 125 for ductile iron body Class 250 valves
      c. Shall be AWWA C207 Class D with ANSI B16.1 Class 125 drilling for steel body Class 25A through Class 150B valves
      d. Shall be AWWA C207 Class E for steel body Class 250 valves
   7. Joints:
      a. Shall be mechanical or push-on type rubber-gasket joint ends
      b. Shall conform to AWWA C111
   8. The use of a stop or lug cast integrally with or mechanically secured to the body for the purpose of limiting disc travel by means of direct contact or interference with the valve disc (in either the open or closed position) will not be acceptable

C. Materials
   1. Body:
      a. Cast iron for Class 25A through Class 150B valves
      b. Ductile iron for Class 250
   2. Disc:
      a. Cast iron or ductile iron for Class 25A through Class 150B valves
      b. Ductile iron for Class 250
   3. Seats:
      a. NBR for services up to 180 Deg F
      b. Shall be body mounted
      c. Shall be resilient type
      d. Mating seat surface shall be stainless steel or Monel
         1) Sprayed or plated mating surfaces are not acceptable
   4. Shaft: 316 stainless steel
   5. Shaft seals:
      a. Shall be designed for use of standard self-adjusting split-V-type packing or Viton O-ring seals
      b. Pull down packing is not acceptable

D. Valve position indicators
   1. Provide position indicators on all exposed operators
   2. Provide handwheel with an arrow with the word open on handwheel rim specifying opening direction

a. Arrow shall be cast on rim and raised
3. Identify open position of valve, 0 - 100%

E. Operator locking devices
1. Modulating service: Infinitely variable locking device or a totally enclosed geared operator as indicated

2.3 BUTTERFLY VALVES (WATER AND PROCESS SERVICE)

A. Manufacturers:
1. Bray
2. Pentair
3. Or Engineer accepted substitution

B. Valve Design and Conditions
1. Bi-directional pressure rating:
a. 175 psi for 2 inch through 12 inch valves
b. 150 psi for 14 inch to 20 inch valves
2. Temperature rating: 180°F with BUNA seat
3. Bi-directional and tested to 110% of full rating
4. Conform to Valve Schedule in this section
5. Valve ends:
a. Shall be wafer or lug design with extended neck as shown on Valve Schedule
6. Joints:
a. Shall be installed between piping flanges
b. Flange locating holes to be provided on wafer bodies

C. Materials
1. Body:
a. Cast iron or ductile iron
b. Polyester coating standard
2. Disc:
a. Nylon coated (gray) ductile iron
3. Seats:
a. BUNA for services up to 180 Deg F
b. Shall be body mounted
c. Shall be resilient type
4. Shaft: 316 stainless steel
5. Shaft seals:
a. Double "U" cup seal design self-adjusting and with positive sealing in both directions.

D. Valve position indicators and actuator
1. Handle and notch plate manual lever operator with disc position indicator
2. Handwheel manual gear operator type with disc position indicator and with an arrow with the word OPEN on handwheel rim specifying opening direction
3. Identify open position of valve, 0 - 100%
4. Manual valve actuator type to be specified in Valve Schedule

E. Operator locking devices
   1. Modulating service: Variable notched locking device or a totally enclosed geared operator as indicated

2.4 BALL CHECK VALVE

A. Manufacturers
   1. Flomatic Valves, Type 408
   2. Flygt Corporation, Type 5087
   3. AVK, Series 53
   4. Or Engineer accepted substitution

B. Design
   1. Ball check valves shall be designed to be non-clog, fully automatic, maintenance free, and specifically suited for operation in wastewater where solids, fibers, grit or highly viscous materials are encountered
   2. Ball check valves are designed to be maintenance-free and suited for installation in the horizontal or vertical position
   3. Ball check valves will have one moving part, the ball, which automatically rolls out of the path of flow, thus providing an unobstructed and "full flow" equal to nominal size. Upon discontinuation of flow, the ball shall automatically roll back to the closed position providing a positive seal against back pressure or backflow
   4. Ball shall have an exterior coating of vulcanized nitrile rubber resistant to grease, petroleum products, animal and vegetable fats, dilute concentrations of acids and alkalines, tearing and abrasion
   5. Valve shall be constructed so that by unbolting and lifting off the cover, the ball may be removed and replaced without removing the valve from the line
   6. Ball check valves will be available with either a floating or sinking ball.
   7. Suitable for 150 psi working pressure (all sizes)
   8. Conform to Valve Schedule criteria in this section
   9. Body and Cover: Flanged iron body shall be nodular cast iron type
   10. Flanges: Shall be ANSI B16.1 Class 125

2.5 SWING CHECK VALVES

A. Manufacturers
   1. APCO (DeZurik), Series 6000 with Oil Control/Bottom Buffer
   2. CCNE (Millikin Co), Model 9001
   3. GA Industries, Model 250D
   4. Val-Matic Valve and Manufacturing Corp, Series 7900
   5. Or Engineer accepted substitution

B. Design
   1. 175 psi working pressure (general). 250 psi working pressure (special case).
   2. Conform to AWWA C508
   3. Conform to Valve Schedule criteria in this section
   4. Unobstructed waterway, quick-closing, spring-loaded, horizontal swing

5. Stainless steel shaft with both ends extending through bronze bushed bearings and outside stuffing boxes
6. Body and Cover: Shall be cast iron, bronze mounted, full opening
7. Flanges: Shall be ANSI B16.1 Class 125
8. Furnish with extended stainless steel hinge with outside lever and weight
9. For vertical installations, adjust lever angle accordingly

2.6 BALL VALVES (BRONZE OR STAINLESS STEEL)

A. Manufacturers for air and water service 2-inches and larger:
1. Jamesbury (Metso)
2. Jenkins (Crane)
3. Crane
4. Nibco
5. Or Engineer accepted substitution

B. Manufacturers for air and water service 2-inches and smaller:
1. Crane
2. Jamesbury (Metso)
3. Jenkins (Crane)
4. Nibco
5. Or Engineer accepted substitution

C. Application
1. Except as otherwise indicated or specified, provide ball valves for all 2-1/2" or smaller shutoff valves
2. Provide additional ball valves as indicated on Drawings or as specified

D. Fabrication
1. Handles showing direction of opening
2. Ball design which does not allow media contact with stem
3. Balancing stop for all applications

2.7 AIR RELEASE AND VACUUM RELIEF VALVES

A. Manufacturer
1. APCO (DeZurik)
2. A.R.I.
3. Val-Matic
4. GA
1. Crispin
2. Or Engineer accepted substitution

B. General
1. Provide as indicated on Drawings
2. Water working pressure: 50 psi
3. Provide a shutoff valve: Ball valve, gate valve, butterfly valve, eccentric action handle

a. Manufacturers:
    1) Nibco
    2) Dyna-Quip
    3) Or Engineer accepted substitution

C. Clean Water Service
4. Individual air release valves:
    a. Provide air release valves at process piping locations as indicated on the Drawings
    b. Inlet and outlet size as indicated on Valve Schedule
    c. Manufacturers:
        1) GA "Figure AR"
        2) Val-Matic "Model 15-38S"
        3) APCO "200A"
        4) A.R.I.
        5) Or Engineer accepted substitution
5. Combination air release and vacuum relief valves: 3-inches and smaller
    a. Provide integral type that functions as both an air vacuum valve and an air release valve
    b. Inlet and outlet size as indicated on Drawings
    c. Manufacturers:
        1) GA "Figure CAV"
        2) Val-Matic "200C Series"
        3) APCO "140C Series"
        4) A.R.I.
        5) Or Engineer accepted substitution
6. Combination air release and vacuum relief valves: 4-inches and larger
    a. Provide air and vacuum valve with externally mounted air release valve
    b. Inlet and outlet size as indicated on Drawings
    c. Manufacturers:
        1) GA "Figure CAV"
        2) Val-Matic "Combination Air Valve"
        3) APCO “Custom Combination Air Release"
        4) A.R.I.
        5) Or accepted substitution

2.8 PRESSURE RELIEF

A. Manufacturers
1. Cla-Val
2. Singer Valve
3. Bermad Valve
4. Or Engineer accepted substitution

B. Performance
1. Provide quick opening at pre-set (adjustable) over pressure and dissipate surge
2. Close slowly when normal line pressure is restored
3. Anticipate surge and open quickly on pre-set duration and then close slowly

4. Provide time delay pilot to close main valve after surge is dissipated to prevent dewatering of system

C. Materials
1. End Connections: Flanged ANSI B16.1 125 lb
2. Valve body and cover:
   a. Cast Steel, ASTM A216-WCB
   b. Cast iron, ASTM A536
   c. Cast Bronze, ASTM B62
3. Trim: Bronze ASTM B62
4. Pilot Control: Bronze, ASTM B62 with Stainless Steel 303 Trim
5. Rubber and Disc: Buna-N synthetic
6. Stem, Nut & Spring: Stainless Steel
7. Diaphragm: Nylon Reinforces Buna-N rubber
8. 1-1/2 inch and Larger: Cla-Val "50-01" or accepted substitution
9. 3/4 inch and smaller: Cla-Val "55F" or accepted substitution

D. Construction
1. Cast iron, conforming to ASTM A126 Class B
2. Bronze mounted
3. Shall be of 10 degrees offset seat design with offset single pivoted hinge
4. Length suitable for concrete wall thickness

2.9 BACKFLOW PREVENTER (DC)

A. Provide a testable dual check (DC) valve assembly and inlet and outlet isolation valves for low hazard backflow prevention

B. Manufacturers:
1. Watts-Febco “DC Type 850”
2. Zurn-Wilkins “DC Type 350XL”
3. Or Engineer accepted substitution

C. Design
1. 1/2 inch to 2 inch
2. Provide bronze body, bronze mounted isolation valves

2.10 BACKFLOW PREVENTER (RPZ)

A. Provide a testable dual check valve assembly with reduced pressure zone (RPZ) and inlet and outlet isolation valves for high hazard backflow prevention

B. Manufacturers:
1. Watts-Febco "RPZ Type 825Y"
2. Zurn-Wilkins “RPZ Type 975XL”
3. Or Engineer accepted substitution

C. Design
1. 3/4 inch to 2 inch size

2. Provide bronze body, bronze mounted isolation valves

2.11 BALL AND BUTTERFLY VALVES (PVC OR CPVC BODY)

A. Use ball and butterfly valves for low pressure small diameter pipe locations
   1. 3” and less in size
   2. Type as shown on Drawings
   3. PVC or CPVC, as indicated on the valve schedule
   4. Valve ends as required by piping with ability to remove valve with unions or flanges
   5. Handle or lever operator, quarter turn

B. Manufacturers
   1. NIBCO
   2. Asahi
   3. Or Engineer accepted substitution

2.12 DIAPHRAGM VALVES (PLASTIC BODY)

A. Use plastic body diaphragm valves in the following services
   1. Sodium hypochlorite
   2. Sodium bisulfite
   3. Sodium hydroxide

B. Manufacturers
   1. Simtech, DVA Series
   2. Asahi America, Type 14
   3. Or Engineer accepted substitution

C. Materials
   1. Body: PVC with reinforcing ribs at body and end connections.
   2. Diaphragm: Unless otherwise specified below, provide 2 diaphragm layers - Teflon diaphragm with EPDM backing or other material suitable for the intended use
      a. For sodium hypochlorite service: 3 diaphragm layers, Teflon (PTFE), PVDF, and ethylene propylene diene monomer (EPDM) or Viton backing cushion
   3. Bonnet: Reinforced polypropylene with cast iron or silicon bronze drive nut, double lead acme stem threads, acrylic protective cap and visual position indicator
      a. Adjustable travel stop: Stainless steel
      b. Compressor: PVDF or cast iron
   4. Handwheel: Polypropylene
   5. Sleeve: Bronze or cast iron
   6. Stem: Stainless steel
   7. Bolt, nut and washer: Stainless steel
   8. Thrust bearing: Teflon disc or carbon steel
   9. End connector: PVC
   10. End connector seal (flange gasket): Suitable for the intended use unless otherwise specified below
      a. For sodium hypochlorite and sodium bisulfite solution service: Hypalon 1/8-inch thick gaskets

11. O-rings: Viton
12. Position indicator: Carbon steel

D. Valve design
   1. End connections: Flanged
   2. Operator handle: Handwheel, with position indicator and adjustable travel stop to prevent overtightening. Provide acrylic stem cap
   3. Diaphragm valves: Weir type
   4. Pressure:
      a. 150 pound per square inch gauge at 70 degrees Fahrenheit

PART 3 EXECUTION

3.1 INSTALLATION

A. General:
   1. Carefully inspect valve before installation. Clean interior. Operate valve to determine parts in proper working order, with valves seating and drain valve operating properly
   2. Install valves and accessories in accordance with the manufacturer's recommendation and in accordance with referenced standards and specifications and shown on Drawings
   3. Provide a union or flanged connection within 2 feet of each threaded end valve unless the valve can otherwise be easily removed from piping
   4. Set valve level and plumb. Actuator to be set plumb or actuator can be set at 90 degrees to valve body if required for proper actuation
   5. Install valve in proper orientation for flow and disc seating
   6. Test valves installed with piping for hydrostatic testing, ensure each valve is operated and able to maintain test pressure and seal tight to isolate each piping section

B. Check valves: Install ball check valves in vertical piping

C. Air release and Vacuum-Relief Valves:
   1. Provide exhaust piping to a suitable disposal point

3.2 ADJUSTMENT

A. Check and adjust valves, actuators, pilotry, and accessories for smooth operation in accordance with manufacturer's instructions

3.3 TRAINING

A. Provide manufacturer certified training on-site for valves and actuators

B. Training to consist of field training and classroom training for valves and actuators as required
   a. Minimum of 4 hours training for valves with pilotry and/or electric/pneu actuators
   b. Minimum of 4 hours training for valves with replaceable seats and seals, or are testable backflow preventers

END OF SECTION

SECTION 16050

BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 GENERAL

1.1 SUMMARY

A. This section includes basic electrical requirements for materials and methods applicable to electrical equipment specified under this section and other related sections.
   1. Conduit
   2. Boxes
   3. Duct Bank
   4. Wire and Cable
   5. Maintenance Materials

B. Related Sections:
   1. Section 01340 – Shop Drawings and Product Data
   2. Section 01500 – Construction Facilities and Temporary Controls
   3. Section 01730 – Operation & Maintenance Data
   4. Section 02300 – Earthwork
   5. Section 03300 – Cast-In-Place Concrete
   6. Section 09900 – Coatings

1.2 REFERENCES

A. UL – All applicable standards

B. IEEE – All applicable standards

C. IPCEA – All applicable standards

D. NEMA – All applicable standards

E. ANSI/NFPA 70 – National Electrical Code

F. ANSI C2 – National Electrical Safety Code

G. ANSI/NEMA FB 1 – Fittings and Supports for Conduit and Cable Assemblies

H. ANSI/NEMA OS 1 – Sheet-steel Outlet Boxes, Device Boxes, Covers, and Box Supports

I. ANSI/NEMA OS 2 – Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports

J. NEMA 250 – Enclosures for Electrical Equipment (1000 Volts Maximum)

1.3 SUBMITTALS

A. Information covering all material that is to be used on this project shall be submitted.

B. Each sheet of descriptive literature shall be clearly marked to identify the material or equipment for which it pertains.

C. Equipment on submitted sheets that is not for this project shall be crossed out.

D. As a minimum the following information shall be submitted:
   1. Equipment sheets shall identify what the equipment refers to by calling out the name of the equipment on the sheet.
   2. Schematics and connection diagrams for all electrical equipment shall be submitted.
   3. Submit all types of conduit and cables with manufacturer and sizes as well as all appurtenances.
   4. Submit shop drawing detailing conduit runs for any new or modified structure for the facility.

1.4 QUALITY ASSURANCE

A. Supplier's qualifications
   1. The entire system shall be designed, coordinated, and supplied by a qualified Electrical Contractor who is regularly engaged in the business of building electrical systems for water and wastewater projects. The Electrical Contractor shall provide a "Statement of Qualifications" indicating that they have successfully provided similar work for at least 5 years.

B. Coordination
   1. The electrical equipment shall be designed and coordinated for proper operation with related equipment and materials furnished by other suppliers under other sections of these specifications. All devices shall be applied in full conformity with the drawings, specifications, engineering data, instructions, and recommendations of the instrument or device manufacturer and the manufacturer of related equipment.
   2. Installation drawings shall be prepared for interconnecting wiring and piping between the related equipment and the equipment furnished under this section. All interconnecting wiring shall be appropriate for the service and shall result in a properly functioning system.
   3. The Contractor shall provide coordination with other contractors and supervision of installation as required during construction.
   4. Accurately record actual locations of conduit, duct banks, panels, and accessories.

1.5 REGULATORY REQUIREMENTS

A. Conform to applicable Building Code.

B. Electrical: Conform to latest version of NFPA 70.

C. Coordinate, obtain and pay for all permits, inspections and approvals of authority having jurisdiction.

D. Comply with local electrical codes in force or in the absence of local electrical code, the latest edition of the National Electrical Code, ANSI C1.

1.6 WARRANTY

A. The electrical contractor shall warrant the supplied equipment and labor for a period of two years from the date of system acceptance.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

A. The work for this project is for a functioning city building. All new work shall be done in a way that allows the existing facility to maintain its operation.

B. All equipment furnished under this Section shall be selected by the Contractor for its superior quality and intended performance. Unless indicated otherwise, all equipment and material shall be new, undamaged, and meet the requirements of UL. Where UL requirements are not applicable, equipment and material shall be identified as such by the supplier and approved by the Engineer before purchase and installation. Equipment and materials used shall be subject to review and shall comply with the following requirements.
   1. Conduit
      a. Minimum Size: ¾ inch unless otherwise specified
      b. Underground Installations:
         i) Over 100V: More than five feet from foundation wall: Use thick wall nonmetallic conduit.
         ii) Within five feet from foundation wall: Use rigid steel conduit
         iii) Under 100V: Use rigid steel conduit
         iv) Minimum size: 1 inch.
      c. Outdoor Locations, Above Grade: Use rigid steel conduit.
      d. In Slab Above Grade:
         i) Use rigid steel conduit for circuits that are 24V or less.
         ii) Use rigid thick wall non-metallic conduit for 120V to 480V circuits.
         iii) Maximum Size Conduit in Slab: 2 inch, 1 inch for conduits that cross over each other, or with structural engineer's approval.
         iv) Conduits shall not be spaced closer than 3 conduit widths on center.
         v) Aluminum conduit shall not be embedded in concrete.
         vi) Conduits shall not pass through a structural concrete beam without the structural engineer's approval.
      e. In or under slab on grade:
         i) Use rigid steel conduit for circuits that are 24V or less.
         ii) Use rigid thick wall non-metallic conduit for 120V to 480V circuits.
      f. Wet and damp locations: Use rigid steel conduit or aluminum conduit.
      g. Dry locations:
         i) Concealed: In walls or above ceilings, use rigid steel or aluminum conduit.
         ii) Exposed: Use rigid steel conduit or aluminum conduit.

h. Rigid Steel Conduit.
    i) Rigid steel conduit shall be heavy wall, hot-dipped galvanized, and shall conform to Fed Spec WW-C-581 and ANSI C80.1, and shall be manufactured in accordance with UL 6.
i. Rigid Nonmetallic Conduit (PVC).
    i) PVC conduit shall be heavy wall, schedule 40, shall be UL labeled for aboveground and underground uses.
j. PVC-Coated Rigid Steel Conduit.
    i) The conduit shall be rigid steel and before the PVC coating is applied, the hot-dipped galvanized surfaces shall be coated with a primer to ensure a bond between the steel substrate and the coating. The PVC coating shall be bonded to the primed outer surface of the conduit at a thickness of at least 40 mils. A two part urethane chemically cured coating shall be applied at a nominal 2 mil thickness to the interior of all conduit and fittings.
    ii) Manufacturers: Ocal, PermaCote, or Robroy Industries.
k. Rigid Aluminum Conduit.
    i) Rigid aluminum conduit shall be heavy wall and shall conform to Fed Spec WW-C-581 and ANSI C80.1, and shall be manufactured in accordance with UL 6.
l. Flexible connections
    i) Conduit: Moisture proof vinyl jacketed, liquid-tight, hot-dipped galvanized flexible steel and shall be UL labeled.
    ii) Connectors: Watertight, Appleton Type ST or STB, Crouse-Hinds Type LT or LTC, or equal.

2. Pull and Junction
    a. Sheet Metal Boxes: NEMA OS 1, Galvanized Steel.
    b. Surface-Mounted Cast Metal Box: NEMA 250, Type 4 flat-flanged, surface-mounted junction box.
        i) Material: Galvanized cast iron Cast aluminum in corrosive areas.
        ii) Cover: Furnish with ground flange, neoprene gasket, and stainless steel cover screws.
        iii) Model: WCB as manufactured by Crouse-Hinds.
    c. In-Ground Cast Metal Box: NEMA 250, Type 6, outside flanged, recessed cover box for flush mounting.
        i) Material: Galvanized cast iron.
        ii) Cover: Nonskid cover with neoprene gasket and stainless steel cover screws.
        iii) Cover Legend: ELECTRIC.
        iv) Model: WPD as manufactured by Crouse-Hinds.
3. Large Junction Boxes and Wiring Gutters
    a. Indoor Locations:
        i) Steel, NEMA 12.
    b. Outdoors:
        i) Stainless steel.
        ii) Weather-tight NEMA 4.
    c. Construction.

i) Provide rigid handles for box covers larger than 9 sq. ft. or heavier than 25 lbs.
ii) Provide split covers for covers larger than 12 sq. ft.
iii) Aluminum boxes in concrete not allowed.

4. Seal Fittings
   a. Model ESU with Apelco sealing cement and fiber, as manufactured by Appleton.
   b. Model EZS with Chico X Fiber and Chico A compound as manufactured by Crouse-Hinds.
5. Deflection Fittings
   a. Locations:
      i) Underground conduit runs.
      ii) Runs between concrete sections subject to relative movement.
   b. Material:
      i) Ferroalloy hubs.
      ii) Neoprene outer jacket.
      iii) Stainless steel jacket clamps.
      iv) Molded plastic inner sleeve.
      v) Tinned copper braid grounding strap.
   c. Model XD as Manufactured by Crouse-Hinds.
6. Expansion Fittings
   a. Locations:
      i) In long conduit runs, to permit linear movement caused by thermal expansion and contraction.
      ii) In long conduit runs to prevent conduit from buckling.
      iii) Indoors and outdoors, where conduit expansion occurs or where there is a wide temperature range.
      iv) At structural expansion joints.
   b. Material:
      i) End fittings: Ferroalloy.
      ii) Body: Steel conduit.
   c. Provide Bonding Strap When Used Outdoors.
   d. Model XJ, as Manufactured by Appleton and Crouse-Hinds.
7. Flexible Sealing Compound
   a. “Duxseal” as Manufactured by Johns-Manville.
   b. “Permagum” as Manufactured by In mount.
8. Coal Tar Epoxy Paint
9. Wire and Cable
   a. 600 Volt Power Cable
      i) General Use:
         a) Conductors: Single, copper, 12 AWG minimum.
         b) All conductors shall be stranded.
         c) Insulation: 600V thermoplastic, UL Type THWN/THHN.
         d) Suitability: Wet or dry locations at 75° C and 90° C copper temperature.
         e) Or as specified for service entrances.
      ii) Service entrance and 4 AWG and above:
         a) Conductors: Single, stranded, copper.

b) Insulation: 600V cross-linked polyethylene, UL Type XHHW/USE or THHN.
c) Suitability: Wet or dry locations at 75°C and 90° C copper temperature.

iii) Terminations
a) Lugs, cup washers or pressure type; do not use wire nuts on stranded cable or wrap standard cable around screw type terminals

b. Lighting Circuits
i) General Use:
a) Conductors: Single, copper, 12 AWG minimum.
b) Conductors may be solid or stranded.
c) Insulation: 600V thermoplastic, UL Type THWN/THHN.
d) Suitability: Wet or dry locations at 75° C and 90° C copper temperature.

ii) Terminations:
a) Lugs, cup washers or pressure type; do not use wire nuts on stranded cable or wrap stranded cable around screw type terminals.

c. Control circuits
i) General Use:
a) Conductors: Single, tinned copper, 14 AWG
b) All conductors shall be stranded
c) Insulation: 600V thermoplastic, UL Type THWN/THHN.

ii) Millivolt or Milliampere Instrumentation and Control.
a) Conductors: 18 AWG stranded copper, 2 or 3 as required.
b) Insulation: 15 mils, minimum, 90°C PVC.
c) Shield: Mylar aluminum tape with 20 AWG copper drain wire, fully covering conductors.
d) Jacket: 20 mils, minimum, 80°C PVC.
e) Suitability: Wet or dry steel conduit.

iii) Manufacturers: Belden "UL Instrumentation Cable – 1032A", Samuel Moore "Dekoron ICMX" No. 1852-686 and 1862-686, or equal.

d. Telephone and Networking
i) Cable.
a) The cables shall be rated for use in communications circuits.
b) The cables shall be rated for riser applications.
c) The cables shall be rated for 75 degrees Celsius applications.
d) The cables shall be free of defects and splices.
e) The cables shall be rated for outdoor applications.
f) The cables shall be rated for P-MSHA applications.
g) The cables shall pass a -40 degree Celsius cold bend test per UL 1581.
h) The cables must be UL third party verified to ANSI/TIA/EIA-586-B.2 Category 5e.
i) The cable shall be ROHS compliant.
j) The cable shall be CE compliant.
k) Conductors
1) The conductors shall be solid, bare copper per ASTM B-3.
2) The conductors shall be #24 AWG (.20 sq mm).
l) Insulation
1) The insulation shall be polyolefin.

2) The insulation shall be free of defects and splices.

m) Pairs
   1) The cable shall contain four pairs.
   2) The insulated conductors shall be bonded together down the entire length of the pair.
   3) The pairs shall be marked with a permanent, extruded stripe identification of tip and ring insulated conductors.
   4) Each pair shall have a unique twist length to minimize pair to pair coupling.

n) Shielding
   1) Shielding shall be an aluminized foil with the foil facing inward, where required.
   2) Unshielded cables shall be acceptable except where shielding is required for the system.

o) Jacket.
   1) All cables shall have a continuous jacket of Polyvinyl Chloride (PVC).
   2) Jacket thickness: The jackets shall be .030" (.75 mm) nominal thickness.
   3) The jackets shall be ultraviolet (UV) radiation and sunlight resistant per UL 1581.
   4) The jackets shall be oil resistant per UL 1581 Class 43.

p) Manufacturer: Belden "Industrial Data Solutions – 7923A" or equal.

10. Grounding and Bonding
    a. Other ground cable shall be as noted on the drawings.
11. Lighting Panels
    a. General:
       i) Circuit breaker panel board.
       ii) With neutral.
       iii) Dead front.
    b. Enclosure:
       i) NEMA 1 or as indicated on the drawings.
       ii) Door with latch and lock.
       iii) Typewritten circuit directory.
       iv) Ground stud bolt through cabinet with removable 1/0 AWG bond to the panel ground bus and an external clamp connector for a station ground conductor.
    c. Circuit Breakers:
       i) Molded case thermal magnetic.
       ii) Multiple pole breakers shall be common trip.
       iii) Bolt-in or plug-in.
       iv) Individually front replaceable.
       v) Indicating "On", "Off", and "Tripped".
       vi) 10,000 amp RMS symmetrical interrupting capacity at 240 V.
       vii) Handle clips to prevent casual operation for circuit breakers indicated on drawings.
       viii) Ground fault interrupting breakers with a sensitivity of 5mA for receptacle branch circuit and where indicated on drawings.

ix) Breakers, trip ratings, and number of poles as indicated on the drawings.

d. Buses:
   i) Two phase and neutral bus insulated from cabinet.
   ii) Ground bus.
      a) Connected to cabinet.
      b) Clamp type lug for supply circuit and each load circuit.
      c) Removable bond to neutral bus.
   iii) Copper.
   iv) Ampere and voltage ratings as indicated on the drawings.
   v) Bracing coordinated with circuit breakers interrupting capacity.

2.2 SPARE PARTS

A. The Supplier shall furnish and deliver the following spare parts.

B. The following spare parts to be furnished as a minimum:
   1. 25% replacement lamps for lighting fixtures.
   2. 25% replacement lamps for pilot light.
   3. Two (2) sets of each type of fuse used in the project.
   4. Two (2) spare ballast of each type specified.

C. All of the above parts shall be provided as spare parts and shall be packaged new in the original manufacturer's packaging. A list of spare parts shall be provided.

PART 3 EXECUTION

3.1 INSTALLATION REQUIREMENTS

A. General Requirements
   1. The instrumentation equipment shall be installed by the Contractor or his subcontractors in accordance with the manufacturers' instructions. The services of the system supplier's technical representative shall be provided as necessary to calibrate, test, and advise others of procedures for adjustment and operation.

B. Inspection
   1. Inspect materials and equipment for signs of damage, deterioration or other deleterious effects of storage, transportation, handling, or defects in manufacture or assembly.
      a. Replace with identical new materials or equipment or repair to like new condition any materials or equipment showing such effects to the satisfaction of the Engineer and Owner.

C. Equipment Installation
   1. Handle, install, connect, clean, condition, align and adjust products and equipment in strict accordance with manufacturer's instructions and in conformity with specification requirements.

a. Separate sheet metal junction boxes, equipment enclosures, sheet metal raceways, etc., mounted on water or earth-bearing walls or wall-mounted outdoors ¼" from wall be corrosion resistant spacer.
b. Seal the base of all outdoor switchgear, motor control center, and similar equipment with grout.
c. Screen or seal with flexible sealing compound all openings into outdoor equipment to prevent the entrance of rodents, wasps, and mud-daubers.
d. Electrical work shall conform to the construction schedule and progress of other trades.
e. Maintain one complete set of manufacturer's installation instructions at the jobsite during installation and until installation is accepted by the Engineer and Owner.
f. Perform all work in accordance with manufacturer's instructions.
    i) Do not omit any preparatory step or installation procedure unless specifically modified or exempted by contract documents.
    ii) Should job conditions or specification requirements conflict with manufacturer's instructions, consult with Engineer prior to proceeding.
g. Field Wiring. Field wiring materials and installation shall conform to the requirements of the electrical section.

D. Identification:
1. Conduit. All conduits shall be provided with identification tags. Tags shall be brass nameplates with 3/8" high lettering and attached to the conduits by means of stainless steel wire. Conduits shall be identified at both ends with the same identification number.
2. Cable. Except for lighting and receptacle circuits, each individual wire in power, control, indication, and instrumentation circuits shall be provided with identification markers at the point of termination. Power wires without individualized identification numbers shall be color coded with electrical tape or colored wire jacket. The wire markers shall be of the heat-shrinkable tube type.
3. Control Stations. Control stations shall be provided with nameplates identifying the related equipment. Pilot controls and indicating lights shall have engraved or etched legends ("start", "stop", etc.) as indicated on the drawings. Nameplates shall be laminated plastic, with 1/8 inch engraved letters, and shall be securely fastened to the control stations.
4. Circuit Breakers. Circuit breakers shall be provided with nameplates identifying related equipment. Nameplates shall be laminated plastic, with 1/8 inch engraved letters, and shall be securely fastened to the circuit breakers.

E. Raceways:
1. General:
    a. Except as otherwise indicated on drawings, conduit shall be concealed in finished areas and exposed in unfinished areas.
    b. Rigid steel conduit and aluminum conduit connections and terminations shall be reamed, de-burred, threaded and provided with bushings.
    c. Securely fasten conduit connections to sheet metal enclosures with locknuts inside and out. Conduit hubs outdoors and in wet locations.

d. Provide deflection fittings across structural joints where structural movement is allowed.
e. Keep conduit clear of structural openings and indicated future openings.
f. Provide flashing and seal watertight conduits through roofs and metal walls.
g. Neatly grout conduit into any opening cut into structure.
h. Cap or plug conduits during construction to prevent the entrance of trash, dirt and water.
i. Minimum conduit size shall be ¾", except ½" for luminaries pendants or as noted on drawings.
j. Seal conduits with flexible sealing compound forced to a minimum depth equal to the conduit diameter after cable is installed.
    i) At handholes, manholes, and vaults.
    ii) Building entrance junction boxes.
    iii) One inch or larger connections to equipment.
k. Provide flexible conduit where flexible connections are necessary, including each motor without flexible cord.
    i) Keep length to a minimum, not to exceed 6' maximum.
    ii) No sharp bends.
l. Provide suitable pull string in each empty or spare conduit.

2. Conduit exposed in structures:
    a. Install parallel to structural members and surface.
    b. Install conduits of the same general routing parallel with symmetrical bends.
    c. Arrange supports to prevent misalignment during wiring installation.
    d. Support conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.
    e. Group related conduits; support using conduit rack. Construct rack using steel channel provide space on each for 25 percent additional conduits.
    f. Install no more than equivalent of three 90° bends between boxes. Use conduit bodies to make sharp changes in direction, as around beams. Use factory elbows for bends in metal conduit larger than 2 inch size.
    g. Provide suitable pull string in each empty conduit except sleeves and nipples.
    h. Maintain 6" clearance to ducts, piping and flues.
    i. Support rigidly with galvanized or cadmium-plated hardware and framing materials, including nuts and bolts.
    j. Provide expansion fittings at 100' centers outdoors, 200' centers indoors; in each conduit run longer than 100' outdoors, 200' indoors.
    k. Provide galvanized pipe caps on conduit stubs for future use.
    l. Allow 7' headroom for horizontal conduit runs, except along structures, piping equipment or where not possible.
    m. Except as otherwise indicated, do not install exposed conduit in water chambers.
    n. Where allowed, coat conduit exposed in water chambers with 2 coats of coal tar paint with paint injuries repaired or use PVC coated conduit.
3. Conduit concealed in structure:
    a. Install between reinforcing steel in slabs with reinforcing in both faces.
    b. Install under reinforcing steel in slabs where only a single layer is provided.
    c. Terminate conduit for future use in equipment or by galvanized couplings and conduit plugs flush with structural surfaces. Seal plugs with self-leveling caulk.

d. Maximum of two conduits crossing each other in slab.

4. Underground:
   a. One inch minimum.
   b. Encased in concrete.
      i) Two inches between conduits.
      ii) Three inches over conduit where not reinforced.
      iii) Three inches over reinforcing.
      iv) Reinforced at and 5’ past portion on disturbed earth or subject to traffic.
      v) Reinforced within 5’ of a structure, manhole or vault.
      vi) Reinforced for entire length and 2’ beyond each adapter to steel conduit if non-metallic is used in duct bank.
      vii) Where capped underground, reinforce the last 2’ and extend steel and conduit 2’ past end of duct bank. Paint all un-encased metal with 2 coats of coal tar paint.
      viii) Continue encasement on outdoor risers to 3” above grade and crown and chamfer top.
   c. Two foot minimum bend radius at vertical risers, 3 foot elsewhere.
   d. Install underground conduit so that it does not drain to cable pulling access in buildings; where necessary, provide a handhole or manhole near or adjacent to building.
   e. Provide 3 foot minimum earth cover.
   f. Install underground conduits through buildings, manhole, handhole and vault walls in box outs as indicated on the drawings.
   g. All steel inside manholes, handholes and vaults shall be galvanized with bared spots treated with zinc rich paint.
   h. Provide ¾” galvanized steel pulling eyes on opposite walls below the centerline of each duct bank.
   i. Provide end bells at wall terminations and adapters for steel conduit continuations for non-metallic duct systems.
   j. Isolate intercommunication and milliampere level instrumentation circuits from all power wiring raceways, conduits, boxes, vaults, manhole and handhole.
   k. Provide a full-size extension for each underground conduit entering a building.
   l. Rigid nonmetallic conduit (PVC) shall be fastened no less than every 4 feet.

5. Junction boxes and wiring gutters:
   a. Install electrical boxes as shown on drawings and as required for splices, taps, wire pulling, equipment connections and compliance with regulatory requirements.
   b. Install pull boxes and junction boxes to maintain headroom and to present neat mechanical appearance.
   c. Install level and plumb.
   d. Where indicated, provide a removable side opposite underground duct banks.
   e. At least code size including space for full size continuation of any conduit not originally continued.
   f. Arrange conduit for maximum space for future conduits.
   g. Support boxes independently of conduit except cast box that is connected to rigid metal conduits both supported within 12 inches of box.

F. Wire and Cable
   1. General:
      a. Protect the cable and avoid kinking conductors, cutting or puncturing jackets, contaminating by oil or grease or damaging in any manner.
      b. Terminate stranded cable with lugs, cup washers, or pressure type connectors; do not wrap stranded cable around screw type terminals.
      c. Splice stranded cable with pressure type connectors; do not use wire nut type connectors on stranded cable.
      d. Splice cables only at readily accessible locations.
      e. Do not pull cable tight against bushings or press heavily against enclosures.
      f. Use cable pulling lubricants as recommended by the cable manufacturer.
      g. Use swab to clean conduits and ducts before pulling cables.
      h. Install cable and accessories in accordance with manufacturer's instructions.
      i. Where necessary to prevent heavy loading of cable connectors due to cable weight, support cables in vertical risers with woven cable grips.
      j. Coil and tape spare cable ends.
      k. Support each 250 MCM or larger cable, and each conduit group of smaller cables from manholes, handholes or vault walls.
      l. Use Stranded conductor for feeders and branch circuits.
      m. Use stranded conductors for control circuits.
      n. Use conductor not smaller than 12 AWG for power and lighting circuits.
      o. Use conductor not smaller than 16 AWG for control circuits.
      p. Use 10 AWG conductors for 20 ampere, 120 Volt branch circuits longer than 100 feet.
      q. Pull all conductors into raceway at same time.
      r. Use suitable wire pulling lubricant for building wire 8 AWG and larger.
      s. Protect exposed cable from damage.
      t. Neatly train and lace wiring inside boxes, equipment, and panel boards.
      u. Clean conductor surfaces before installing lugs and connectors.
      v. Make splices, taps, and terminations to carry full ampacity of conductors.
   2. Special cables:
      a. Isolate networking and milliampere level instrumentation cables from all power circuits.
   3. Conductor identification:
      a. Color code all service, feeder, and branch circuit conductors, 277/480 VAC and above as follow:
         i) Phase A: Brown
         ii) Phase B: Orange
         iii) Phase C: Yellow
         iv) Neutral: White
         v) Ground: Bare or Green
      b. Color code all feeder, and branch circuit conductors, 120/208 VAC as follows:
         i) Phase A: Red.
         ii) Phase B: Black.
         iii) Phase C: Blue.
         iv) Neutral: White.
         v) Ground: Bare or Green.

c. Identify single control conductors by color coding orange and by labeling each end of conductors by color coding orange and by labeling each end of conductor with heat shrink-tube type wire markers.
d. Identify multi-conductor instrumentation and control cables with heat shrink-tube type wire markers.
e. Contractor shall establish a control and instrumentation conductor and cable identification system acceptable to Engineer.

G. Grounding Materials:
1. Coordinate installation with other disciplines.
2. Install Products in accordance with manufacturer's instructions.
3. Provide bonding to meet Regulatory Requirements.
4. All branch circuit and feeder circuits to include a copper ground conductor in addition to the conduit ground connection.
5. Connect ground conductors to equipment by ground lugs or clamps.
a. If no ground bus or terminal is provided and enclosure is not explosion-proof or submersible provide a clamp type lug under a permanent assembly bolt or by grounding locknuts or bushings.
b. If an explosion-proof or submersible enclosure is not provided with grounding means, provide an adjacent junction box with a ground lug.
c. Bond grounding system to station piping by connection to the first flange inside the building on either a suction or discharge pipe which will form a good ground connection:
i) Drill and tap the flange.
ii) Provide a bolted connection.
iii) Bond with a copper bar or strap.
d. Form ground conductors on equipment to the contours of the equipment.
e. Install main ground cables with encased underground conduit banks in earth at least 3" below 1 corner of the duct bank.
f. Bond ground cables in underground circuits to main ground cables at each manhole, handhole, and vault.

H. Networking – EtherNet/IP cabling
1. Install sufficient networking cable, as shown in the contract drawings, to provide a complete networked system.
2. Terminate all wiring with RJ-45 connectors rated for Cat 5e cable transmissions.
3. Test every communication cable, and provide a testing certificate with the results.

3.2 FIELD QUALITY CONTROL

A. Low Voltage Cable Testing
1. Test 600 V power cables for continuity and freedom from short circuits and ground, except where grounding is intentional immediately after installation.
2. Test all circuits with a 500 V megger or its equivalent.
3. Replace conductors which read less than 1.5 Megohms between conductors and ground.

3.3 PROTECTION AND STORAGE

A. Protection of equipment during storage:
   1. During construction, all electrical equipment shall be protected against absorption of moisture, and metallic components shall be protected against corrosion. This protection shall be provided immediately upon receipt of the equipment and shall be maintained continuously. Any means necessary shall be used to protect the equipment at the Contractor's expense.

END OF SECTION