☐ **Executed Contract File**
☐ **Contractor**
☐ **Finance**
☐ **City Clerk**
☐ **Surety**
☐ **Granting Agency**
☐ Project Manager
☐ CM/Inspector
☐ Design Professional
☐ _____

City of Kansas City, Missouri
Water Services Department
Kenneth C. Morgan P.E., Director

Project Manual

PROJECT/CONTRACT NO. 80002543/9911

VERTICAL WELLS 2-5 REPLACEMENT

BIDDER/ADDRESS

Company
Contact _____
Address
Phone _____
Fax
Email

Project Manager: Hamza Damer
Telephone: 816-513-0219
Email: hamza.damer@kcmo.org

CITY OF FOUNTAINS
HEART OF THE NATION

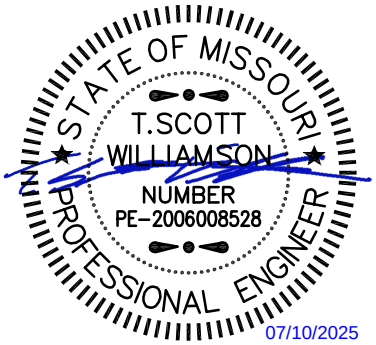
KANSAS CITY
MISSOURI

CERTIFICATION PAGE

Project Number 80002543/9911

I am responsible for the following specifications and drawings:

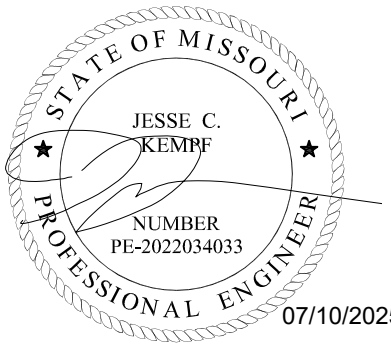
Drawings:	Specifications:
VW-G-000 through VW-G-002 VW-C-001 through VW-C-507 VW-D-101 through VW-D-301	01015, 01070, 01300, 01310, 013120, 013180, 01400, 014505, 01500, 01610, 01612, 01614, 01650, 02050, 02200, 02200, 02202, 02512, 02522, 02610, 02670, 02675, 02704, 02850, 02930, 03600, 05550, 09940, 11060, 11145, 15010, 15020, 15061, 15064, 15065, 15067, 15091, 15100, 15101, 15108, 15130, 15140, 15180, 15250



(SEAL)

I am responsible for the following specifications and drawings:

Drawings:	Specifications:
	16100



07/10/2025

(SEAL)

I am responsible for the following specifications and drawings:

Drawings:	Specification
VW-E-001 through VW-E-602	16050



Craig Brewster

07-10-2025

_____ (SEAL)

I am responsible for the following specifications and drawings:

Drawings:	Specifications:
VW-I-001 through VW-I-901	13500, 13530,13550, 13561, 13562, 13563, 13570, 13590



07-09-2025

_____ (SEAL)

EACH PROFESSIONAL WHOSE SIGNATURE AND PERSONAL SEAL APPEARS ABOVE ASSUMES RESPONSIBILITY IN THESE BIDDING DOCUMENTS ONLY FOR WHAT IS LISTED ABOVE AND DISCLAIMS (PURSUANT TO SECTION 327.411 RSMO) ANY RESPONSIBILITY FOR ALL OTHER PLANS, SPECIFICATIONS, ESTIMATES, REPORTS, OR OTHER DOCUMENTS OR INSTRUMENTS NOT SEALED BY THE SIGNED PROFESSIONAL RELATING TO OR INTENDED TO BE USED FOR ANY PART OR PARTS OF THE PROJECT.

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Project Number 80002543/9911

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Item	Set /Title /Description /Designation	Drawing No(s).	Dated
1	VW-G-000	Cover Sheet and Index of Drawings	
2	VW-G-001	General Notes and Legend	
3	VW-G-002	Abbreviations	
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The Drawing listed above are supplemented by drawings bound in the Project Manual and listed in the Table of Contents.

End of Section

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CITY OF FOUNTAINS
HEART OF THE NATION

KANSAS CITY
MISSOURI

INVITATION TO BID

Project/Contract Number 80002543/9911

Project Title Vertical Wells 2-5 Replacement

The General Services Department of Kansas City, Missouri will receive sealed Bids until **2:00 PM, on February 3, 2026 4800 E. 63rd Street, Kansas City, MO. 64130 at the Water Services Department for project Vertical Wells 2-5 Replacement – project No. 80002543**. Bids will be opened after that time.

City desires that Minority Business Enterprises (MBE) and Women's Business Enterprises (WBE) have a maximum opportunity to participate in the performance of City contracts. The goals for this specific Project are (**11**%) MBE participation and (**11%**) WBE participation.

Bidding Documents will be available online to all interested parties at the Kansas City, Missouri Plan Room, http://www.kcmoplanroom.org. All addenda will be posted at this location. Any document or plan may be viewed or downloaded from this location.

Bidders are requested to attend the Mandatory In-Person, Pre-Bid Conference at **10 a.m., on Monday, January 12, 2026.** Water services Department. 4800E. 63rd. St. Kansas City MO 64130

Project Manager: Hamza Damer
Phone Number:816-513-0219
E-mail: hamza.damer@kcmo.org

Contract Administrator: Marzella Newman-Buckner
Phone Number: 816-513-0319
E-mail: marzella.newman-buckner@kcmo.org

View all procurement and contracting opportunities at http://www.kcmo.org

CITY OF FOUNTAINS
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KANSAS CITY
MISSOURI

INSTRUCTIONS TO BIDDERS

Project /Contract Number: 80002543/9911

Project Title Vertical Wells 2-5 Replacement

1. Sealed Bids for project -**Vertical Wells 2-5 Replacement – 80002543/9911** will be received by the General Services Department **at 4800 E. 63rd Street, Kansas City, Missouri 64130 at the Water Services Department until 2:00 P.M., on February 3, 2026**, at which time bidding will be closed.

   a. All Bids will be opened and read aloud. The Bid Envelope must contain all required submissions to be included with the Bid. No Bid may be withdrawn for a period of ninety (90) days after the Bid is opened. Bid security shall likewise continue for the same ninety (90) days unless earlier released by the City. The successful Bidder shall comply with all Bidding and contract requirements. Bids, once opened and read, may not be withdrawn without forfeiture of the Bid security.

   b. All Bids shall be addressed to the Senior Procurement Officer, shall state on the outside of the sealed Bid envelope "Bid Enclosed", title and Project number, and shall be deposited in the locked Bid box. All Bids must comply with the Bidding Requirements of Kansas City, Missouri (CITY).

2. Consideration of Bids

   a. The City will determine the lowest, responsive and responsible Bid. The City may reject any or all bids. If the City rejects all Bids, the City may: (1) resolicit Bids following the City's normal solicitation procedure; or (2) solicit Bids only from those Bidders that submitted a Bid pursuant to the original solicitation; or (3) use an expedited Bid submission schedule with or without readvertising or issuing any other public notice when the City determines that the delay from the normal City solicitation procedure would not be in the City's best interests.

   b. Alternates. If this solicitation includes Bid Alternates, the City, in its sole discretion, may include any, all or none of the Alternates in determining the lowest, responsive and responsible Bid. In determining lowest, responsive and responsible Bid, the City may include the Alternates in any combination and in any order or priority or choose none of the Alternates. The City may make this determination at any time after Bid Closing and prior to Contract award. The City will act in the best interest of the City in determining whether to include any, all or none of the Alternates and the combination and priority of any Alternates selected. If additional funding becomes available after Contract award, City may add any or all of the Alternates to the Contract by change order.

3. Evidence of Competency to Perform. Each bidder shall furnish with the bid satisfactory evidence of Bidder's competency to perform the proposed work. Such evidence of competency shall consist of the following:

   a. Completed Form 00410.01 Experience Reference Summary for three projects of similar scope performed within the past 5 years including the name, address and telephone number of the contact person having knowledge of the project and the dollar value of the project.

   b. Statement that, during the three (3) years immediately preceding the date of the Bid, Bidder has received no written notices of violations of any federal or state prevailing wage statute in which prevailing wage penalties were assessed against the Bidder or Bidder has been found in such but has made restitution to affected workmen and complied with any statutory penalty; and a

statement that Bidder is current on payment of Federal and State income tax withholdings and unemployment insurance payments

c. Statement that Bidder participates in a training program that facilitates entry into the construction industry and which may include an on-the-job or in-house training program. By submitting its Bid, Bidder is agreeing to timely submit during the 48 hours after Bid opening an affidavit of describing such program and Bidder's participation.

d. Identify the following Key Personnel proposed for the Project. (**NOTE:** Key Personnel must be committed to the Project for its duration and may not be removed or substituted without the City's prior written consent.)

   (1) GC Project Manager

   (2) On-Site Field Superintendent

   (3) QC/QA Manager

   (4) Safety Officer

e. For each of the Key Personnel, provide the following background information.

   (1) Years of employment with current employer

   (2) City of residence

   (3) Identify any other projects this person will be involved with concurrently with the Project, and state the time commitment for the Project and each other project

   (4) Discuss professional registrations, education, certifications, and credentials held by this person that are applicable to the Project

f. Discuss generally the tasks involved in the Project.

g. Illustrate clearly and concisely Bidder's understanding of the technical elements that must be addressed for successful completion of the Project.

h. Submit a bid schedule with anticipated milestones for the Project using Microsoft Project 2007 or later format.

i. Describe key issues that might affect the Project schedule and how Bidder proposes to address them.

j. Summary of the Project Safety Plan for the Project.

   (1) Describe how Bidder proposes to address any unique safety issues for the Project

   (2) Describe your safety record and environmental compliance record along with your Firm's OSHA reportable accident rates on recent comparable size projects

   (3) Statement of Bidder's Experience Modification Ratio (EMR)

k. Discuss Bidder's understanding of the traffic control required for the Project, if applicable, and how traffic control will impact the Project schedule. Discuss any major traffic control issues that need to be addressed and Bidder's proposed solutions.

l. Identify any other special issues or problems that are likely to be encountered. Outline the manner in which Bidder suggests resolving them.

m. Outline key community relations issues and how they might be resolved.

n. Describe any difficulties Bidder anticipates encountering in serving the City, in light of the City's status as a municipality and public entity. Explain how Bidder plans to manage them.

o. Summary of Bidder's Quality Assurance/Quality Control Plan for this project

p. Statement regarding all work performed two (2) years immediately preceding the date of the Bid, that contains either (a) a contract by contract listing of any written notices of violations of any

federal, state or local DBE/MBE/WBE Program and any damages assessed; or (b) a statement that there have been no such written notices of violations or such penalties assessed; and a statement that Program requirements have been met.

q. Statement that the Bidder has not been rescinded or debarred from any bidding, contractual, procurement, or other such programs by federal, state or local entities.

r. Statement that Bidder is current on payment of Federal and State income tax withholdings and unemployment insurance payments

s. Statement of Bidder's litigation and/or arbitration history over the past five (5) years including final ruling.

t. Statement of Bidder's bond history over the past five (5) years including any incidences of failure to perform.

u. MBE / WBE past project performance and compliance with participation goals in comparable size commercial projects

v. Other.

4. Waiver of Bid Requirements The City Manager or his delegate at any time may waive any requirements imposed by this solicitation or by any City regulation when failure to grant the waiver will result in an increased cost to the City and the requirement waived would be waived for all Bidders for this solicitation and it is in the best interest of the City to grant the waiver. The City Council at any time may waive any requirements imposed in this solicitation by the City's Code of Ordinances when it finds failure to grant the waiver will result in an increased cost to the City and the waived requirement would be waived for all Bidders for this solicitation and it is in the best interest of the City to grant the waiver. The City reserves the right to waive any irregularities and/or formalities as deemed appropriate.

5. Late Bids Bids and modifications of Bids received after the exact hour and date specified for receipt will not be considered unless: (1) the Bid is sent via the U.S. Postal Service, common carrier or contract carrier, by a delivery method that guarantees the Bid will be delivered to the City prior to the submission deadline; or (2) if the Bid is submitted by mail, common carrier or contract carrier it is determined by the City that the late receipt was due solely to an error by the U.S Postal Service, common carrier or contract carrier; or (3) the Bid is timely delivered to the City but is at a different City location than that specified in this IFB; or (4) the City extends the time after the deadline for a force majeure event that could potentially affect any or all Bidders meeting the deadline.

6. Interpretations and Addenda All questions about the meaning or intent of the Bidding Documents may be directed to the Project Manager listed at the end of these Instructions to Bidders. Interpretations or clarifications considered necessary by the Project Manager in response to such questions will be issued by Addenda to all parties recorded as having received the Bidding Documents. Questions received less than six (6) days prior to the date for opening of Bids may not be answered. Only answers issued by formal written Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect. Addenda may also be issued to modify the Bidding Documents as deemed advisable by the City.

7. Bid Security Requirements All Bids submitted must be accompanied by a Bid deposit in the amount of five percent (5%) of the base Bid which shall be in the form of a Bid Bond (on the form provided in these Bidding Documents), Cashier's Check, Letter of Credit, Certificate of Deposit or other instrument approved in advance by the City. Prior to submittal of the Bid the City Treasurer must approve both the financial institution and text of a Letter of Credit. A Cashier's Check or a Certificate of Deposit shall be payable to the City Treasurer.

8. Forfeiture of Security If a Bidder fails or refuses to execute the Contract when requested by the City, any Bid security given to the City shall immediately become due and payable and forfeited to the City as liquidated damages.

9. Mistake in Bid Security By submitting a Bid, Bidder is agreeing to correct any mistakes on a Bid security submission when requested by the City. When such a mistake occurs and a Bidder fails or

refuses to correct the mistake or execute the Contract when requested by the City, any Bid security shall be forfeited to the City and the Bidder shall also be subject to debarment and damages.

10. Bids that Exceed the Engineer's Estimate The City may offer the apparent lowest, responsive and responsible Bidders the option of performing the Work for the Engineer's estimate for the Project with no changes to the Bid requirements or scope of the Project if the Bid is not more than five percent higher than the Engineer's estimate.

11. Post Bid Required Submissions The successful Bidder will be required to submit the following documents with the signed copies of the Bid Form/Contract or within the timeframes specified in the Notice of Intent to Contract letter. Copies of the City's forms that the successful Bidder will be required to sign are bound into this Project Manual for information:

a. Properly signed, dated, and sealed Performance and Maintenance Bond and Payment Bond;

b. Properly completed certificates of insurance.

c. Copies of licenses required by the City to do the Work;

d. A copy of CONTRACTOR's current Certificate of Good Standing or Fictitious Name Registration from the Missouri Secretary of State, or other acceptable proof; and

12. Indemnification – City of Kansas City. The contract documents contains a requirement that Contractor shall indemnify, defend and hold harmless the City and any of its agencies, officials, officers, or employees from and against all claims, damages, liability, losses, costs, and expenses, including reasonable attorneys' fees, arising out of or resulting from any acts or omissions in connection with the contract, caused in whole or in part by Contractor, its employees, agents, or Subcontractors, or caused by others for whom Contractor is liable, including negligent acts or omissions of the City, its agencies, officials, officers, or employees. The contract requires Contractor to obtain specified limits of insurance to insure the indemnity obligation. Contractor has the opportunity to recover the cost of the required insurance in the Contract Price by including the cost of that insurance in the Bid amount.

13. Indemnification – State of Missouri. The contract documents contains a requirement that Contractor shall indemnify, defend and hold harmless the Missouri Highways and Transportation Commission (MHTC) and the Missouri Department of Transportation (MoDOT) and their respective employees from and against all claims, damages, liability, losses, costs, and expenses, including reasonable attorneys' fees, arising out of or resulting from any acts or omissions in connection with the contract, caused in whole or in part by Contractor, its employees, agents, or Subcontractors, or caused by others for whom Contractor is liable. The contract requires Contractor to obtain specified limits of insurance to insure the indemnity obligation. Contractor has the opportunity to recover the cost of the required insurance in the Contract Price by including the cost of that insurance in the Bid amount.

14. City's Buy American and Missouri Preference Policies It is the policy of the City that any manufactured goods or commodities used or supplied in the performance of any City contract or any subcontract thereto shall be manufactured or produced in the United States whenever possible. When Bids offer quality, price, conformity with specifications, term of delivery and other conditions imposed in the specifications that are equal, the City shall select the Bid that uses manufactured goods or commodities that are manufactured or produced in the United States. The City shall give preference to all commodities manufactured, produced, or grown within the State of Missouri and to all firms, corporations, or individuals doing business as Missouri firms, corporations or individuals, when quality is equal or better and delivered price is the same or less. It is the bidder's responsibility to claim these preferences.

15. Affirmative Action It is the policy of the City that any person or entity entering into a contract with the City, will employ applicants and treat employees equally without regard to their race, color, sex, religion, national origin or ancestry, disability, sexual orientation, gender identity or age. Bidder will be required to comply with the City's Affirmative Action ordinance if Bidder is awarded a contract from the City totaling more than $300,000.00. If you have any questions regarding the City's Affirmative Action requirements, please contact CREO KC at (816) 513-1836 or visit the City's website at www.kcmo.gov.

16. Tax Clearance Bidder will be required to furnish to CITY sufficient proof from City's Commissioner of Revenue, verifying that Bidder is in compliance with the license and tax ordinances administered by City's Revenue Division as a precondition to CITY making its first payment under any CONTRACT over $160,000.00. Bidder will also be required to obtain proof of City tax compliance from all of its Subcontractors prior to the Subcontractors performing any Work.

17. Substitutions or "Or-Equal" Items The procedure for submission of substitutions or "or-equal" items is set forth in the General Conditions and Supplementary Conditions.

18. Prevailing Wage Requirements The successful Bidder shall pay the prevailing hourly rate of wages as determined by the Missouri Annual Wage Order and/or Federal Wage Determination set forth in the Project Manual. In case of a conflict between Missouri and Federal wage rates, the higher rate shall apply.

Successful Bidder shall be required to use City's Internet web based Prevailing Wage Reporting System provided by City and protocols included in that software during the term of this Contract. When requested by the City, Bidder shall submit user applications to City's provided Prevailing Wage Contract Information Management System. Successful Bidder shall be required to use City's Internet web based Contract Information Management System/Project Management Communications Tool provided by City and protocols included in that software during the term of this Contract. Bidder/Proposer shall submit user applications to City's provided Contract Information Management System for all personnel, subcontractors or suppliers as applicable.

MBE/WBE Program Requirements City desires that Minority Business Enterprises (MBE) and Women's Business Enterprises (WBE) have a maximum opportunity to participate in the performance of City contracts. The goals for this specific Project are (**11%**) MBE participation and (**11%**) WBE participation. The City's CREO KC Forms and CREO KC Instructions for Construction Projects are incorporated into these Bidding Documents and the Contract Documents. The MBE/WBE Directory is available on the City's website at www.kcmo.gov. Please call the Civil Rights and Equal Opportunity Department at (816) 513-1836 for assistance.

Successful Bidder shall be required to use City's Internet web based MBE/WBE Program Reporting System provided by City and protocols included in that software during the term of this Contract. When requested by the City, Bidder shall submit user applications to City's provided MBE/WBE Program Reporting System for all applicable personnel and shall require subcontractors/subconsultants to submit same.

19. Waiver of MBE/WBE Requirements The City Council may waive any and all MBE/WBE requirements imposed by any Bidding Document or the MBE/WBE Ordinance and Contract with the lowest, responsive and responsible Bidder if the City Council determines a waiver is in the best interests of the City.

20. Forfeiture of Bid Bond for Failure to Make MBE/WBE Submissions By submitting its Bid, Bidder is agreeing to the following: (1) Bidder has made by Bid opening a good faith effort to meet the MBE/WBE goals established for the Project; or Bidder will continue to make during the 48 hours after Bid opening a good faith effort to meet the MBE/WBE goals established for the Project; and (2) Bidder will timely submit its 00450 CREO KC Construction Contractor Utilization Plan/Request for Waiver (CREO KC Form 8) and 00450.01 Letter of Intent to Subcontract for each MBE/WBE listed on the 00450 CREO KC Construction Contractor Utilization Plan/Request for Waiver; and (3) Bidder will submit documentation of its good faith efforts to meet the MBE/WBE goals when requested by the City. Failure to meet these requirements in good faith will result in Bidder being debarred and forfeiting its Bid Bond.

Forms and Instructions for Construction Projects are incorporated into these Bidding Documents and the Contract Documents.

21. Workforce Program Requirements. City desires that minorities and women have a maximum opportunity to practice their trades on city construction projects. The minimum company-wide goals are a ten percent (10%) minority workforce and two percent (2%) women workforce. The City's CREO KC Forms and CREO KC Instructions for Construction Projects are incorporated into these Bidding Documents and the Contract Documents.

Successful Bidder shall be required to use City's Internet web based Workforce Program Reporting System provided by City and protocols included in that software during the term of this Contract. When requested by the City, Bidder shall submit user applications to City's provided Workforce Program Reporting System for all applicable personnel and shall require subcontractors to submit same.

22. Subcontractors, Suppliers and Others

a. If the Contract Documents require the identity of certain Subcontractors, Suppliers and other persons and organizations (including those who are to furnish the principal items of material and equipment) to be submitted to City, the apparent lowest, responsive and responsible Bidder, and any other Bidder so requested, shall submit to City a list of all such Subcontractors, Suppliers and other persons and organizations proposed for those portions of the Work for which such identification is required. An experience statement shall accompany such list with pertinent information regarding similar projects and other evidence of qualification for each such Subcontractor, Supplier or organization if requested by City. If City has reasonable objection to any proposed Subcontractor, Supplier or other person or organization, City may request the apparent lowest, responsive and responsible Bidder to submit an acceptable substitute without an increase in Bid price.

b. By submitting its Bid, Bidder agrees that it has read and understands all the provisions of General Condition No. 6.07, Concerning Subcontractors, Suppliers and Others, and that it will comply with all those provisions including but not limited to mandatory mediation of disputes and the prohibition against paid-if-paid and paid-when-paid contract clauses. It is the City's expectation that all Subcontractors and Suppliers will be treated fairly and in good faith by the successful Bidders and that the successful Bidder will make all reasonable efforts to resolve contract disputes with a Subcontractor or Supplier in a prompt and fair manner. If the City is notified by a Subcontractor or Supplier of a contract claim with the successful Bidder, City will notify the successful Bidder and will request prompt resolution of the claim. City will provide any such Subcontractor or Supplier information regarding mandatory mediation as well as a copy of the Payment Bond. City may notify the Surety that City has taken cognizance of such claim.

c. In accordance with the Missouri Prompt Payment Act, City reserves the right to withhold payment(s) in good faith from the successful Bidder due to: i)the successful Bidder's failure to comply with any material provision of the contract; ii)third party claims filed or reasonable evidence that a claim will be filed; iii)the successful Bidder's failure to make timely payments for labor, equipment or materials; or iv)for damage to a Subcontractor or Supplier.

d. By submitting its Bid, Bidder agrees it will not deny any Subcontractor subcontracting opportunities solely because the Subcontractor is not a signatory to collective bargaining agreements with organized labor.

e. The provisions of GC 6.07 are a material term of the Contract with the City and failure by the successful Bidder to comply with the provisions of this section will be taken into consideration by City in making the determination of lowest, responsive and responsible bidder in any subsequent City contracts.

23. Pre-Bid Conference The Water Service Department will hold a pre-Bid conference on January 12, 2026, at 10:00 AM.

Attendance at the pre-Bid conference is **Mandatory** for all Bidders on this Project. For this Project, the City shall not contract with a Bidder who has not attended the entire pre-Bid conference for this Project.

24. **On-Site Inspection** The Project Site will be available for inspection by Bidders. Bidders visiting the Project Site shall be responsible for their own safety. The Project Site shall be available for inspection by appointment from 9:00 A.M. to 2:00 P.M., each day Monday through Friday (holidays excepted). Bidders may contact the following individual from the Water Services Department for an appointment.

Contact: Hamza Damer

Phone: (816) 513-0219 -E-mail hamza.damer@kcmo.org

25. Signatures Each copy of the Bid Form/Contract must be signed and properly dated by the following, as applicable:

Limited Liability Company:

□ a member of the limited liability Company authorized to sign on behalf of the company.

Partnership:

□ a partner authorized to sign on behalf of the partnership.

Sole Proprietor:

□ the proprietor.

Joint Venture:

□ the parties to the Joint Venture authorized to sign on behalf of each party to the Joint Venture, or a person authorized by each party to the Joint Venture to sign on behalf of all parties to the Joint Venture.

Corporation:

□ a corporate office authorized to sign on behalf of the corporation. Corporation's seal must be attached to the signature.

26. Forward all questions in writing to the following Project Manager and Contract Administrator. Questions received less than **Five (5)** days prior to the Bid Date may not be answered. Interpretations or clarifications considered necessary by the Project Manager in response to such questions will be issued by Addenda to all Bidders. Oral or other interpretations or clarifications shall be without legal effect, even if made at a Pre-Bid Meeting.

Hamza Damer, Project Manager
Water Services Department
4800 E. 63rd Street
Kansas City, MO. 64133
(816) 513-0216
E-mail: hamza.damer@kcmo.org

Marzella Newman-Buckner, Contract Administration
Water Services Department
4800 E. 63rd Street
Kansas City, MO. 64133
(816) 513-0319
E-mail: marzella.newman-buckner@kcmo.org



For persons with disabilities needing reasonable accommodations please contact Daniel O'Conner at 816-513-1824 or Cowan Byers at 816-513-1802. If you need to use the Relay Missouri Center call 1-800-RELAY-MO (1-800-735-2966).

Bidder: _____

BID FORM/CONTRACT

Project/Contract Number: 80002543/9911

Project Title: Vertical Wells 2-5 Replacement

1. Bidder, having examined the Bidding Documents, related documents and the Site of the Work, and being familiar with all the conditions affecting the construction of the proposed Work, including Laws and Regulations and the availability of materials and supplies, agrees, if this Bid is selected by CITY, this Bid Form/Contract will become the Contract between Bidder and CITY for Bidder to furnish all labor and materials, equipment and services necessary for the proper completion of the Work in accordance with the Contract Documents, including general construction work at the price(s) stated below, which stated sums include fees and all other charges applicable to materials, appliances, labor and all things subject to and upon which other charges may be levied.
2. Bidder agrees the Contract Documents will comprise the entire agreement between CITY and Bidder. The Contract Documents are identified in the General Conditions and are incorporated into and made part hereof this Bid Form/Contract by reference.
3. Bidder agrees that if this Bid Form/Contract is executed by CITY, Bidder's offer is accepted and this Bid Form/Contract that incorporates all other Contract Documents shall constitute the Contract between the parties. Bidder authorizes the CITY to fill in the Contract Price on this Bid Form/Contract in accordance with Bidder's Bid. Bidder agrees that this Bid Form/Contract may be executed in one or more counterparts, each of which will be deemed an original copy of this Bid Form/Contract and all of which, when taken together, will be deemed to constitute one and the same Bid Form/Contract. This Bid Form/Contract shall be effective upon the execution of counterparts by both parties, notwithstanding that both parties may not sign the same counterpart. The parties' signatures transmitted by facsimile or by other electronic means shall be proof of the execution of this Bid Form/Contract and shall be acceptable in a court of law. A copy of this Bid Form/Contract shall constitute an original and shall be acceptable in a court of law.
4. The Bid Price(s) shall be shown in numeric figures only.

   TOTAL BASE BID IN NUMERIC FIGURES $_____

   TOTAL BID IN NUMERIC FIGURES $_____
5. The undersigned Bidder has given CITY'S Project Manager written notice of all conflicts, errors or discrepancies that it has discovered in the Contract Documents and the written resolution thereof by the Project Manager or by the DESIGN PROFESSIONAL is acceptable to Bidder.
6. The undersigned Bidder agrees that this Bid shall remain subject to selection by CITY, and may not be withdrawn for ninety (90) days after the day Bids are opened.
7. The undersigned Bidder certifies that this Bid contains no modifications, deviations, riders or qualifications.
8. The undersigned Bidder acknowledges receipt of the following addenda listed by number and date appearing on each addendum:

Addendum Number	Dated	Addendum Number	Dated
(_____)	(_____)	(_____)	(_____)
(_____)	(_____)	(_____)	(_____)

(_____) (_____) (_____) (_____)

(_____) (_____) (_____) (_____)

(_____) (_____) (_____) (_____)

(_____) (_____) (_____) (_____)

(_____) (_____) (_____) (_____)

9. By submitting its bid, Bidder is agreeing to meet or exceed the minimum employment goals of 10% minority and 2% women during the term of its contract with the City, or request a waiver of the goals. If a waiver is requested, Bidder must establish good faith efforts towards meeting the goals as set forth in the CREO-KC Instructions for Construction Contracts and the City's Workforce Ordinance. Should Bidder fail to meet or exceed the minimum employment goals or otherwise establish that Bidder is entitled to a waiver under circumstances in which Bidder has previously failed to meet or exceed the goals on one or more occasions with the twenty-four month period immediately preceding the completion of the Work under this Bid Form/Contract, Bidder may be suspended from participating, either as a contractor or subcontractor, on any future contract with the City for a period ranging from thirty days to six months as further specified in the Contract Documents.

10. By submitting its bid, Bidder warrants that if its bid should exceed $300,000.00 and Bidder employs fifty (50) or more people, Bidder has an affirmative action program in place and will maintain the affirmative action program in place for the duration of its contract with the City. Bidder further warrants that it will comply with the affirmative action requirements contained in the General Conditions as incorporated by reference into this Bid Form/Contract.

11. Section 13 through Section 17 constitutes the Affidavit of Intended Utilization required to be submitted by Bidders.

12. By submitting its bid, Bidder is agreeing to the following: (1) Bidder has made by bid opening a good faith effort to meet the MBE/WBE/DBE goals established for the project; or Bidder will continue to make during the 48 hours after bid opening a good faith effort to meet the MBE/WBE/DBE goals established for the project; and (2) Bidder will timely submit its **00450 CREO-KC 08 Contractor Utilization Plan/Request for Waiver** and **00450.01 Letter of Intent to Subcontract** for each MBE/WBE listed on the 00450 CREO-KC 08 Construction Contractor Utilization Plan/Request for Waiver;; and (3) Bidder will submit documentation of its good faith efforts to meet the MBE/WBE/DBE goals when requested by the City. Failure to meet these requirements in good faith will result in Bidder forfeiting its bid bond.

PROJECT GOALS: **_11_ % MBE__11_____% WBE _____ % DBE**

BIDDER PARTICIPATION: **_____% MBE _____% WBE _____ % DBE**

13. To the best of Bidder's knowledge, the following are names of certified MBEs and/or WBEs with whom Bidder, or Bidder's subcontractors, presently intend to contract with if awarded the Contract on the above project: ***(*All firms must currently be certified by Kansas City, Missouri Civil Rights and Equal Opportunity Department*)***

    A. Name of M/WBE Firm _____
    Address _____
    Telephone No. _____
    I.R.S. No. _____
    Area/Scope of work _____

Subcontract amount _____

B. Name of M/WBE Firm _____
Address _____
Telephone No. _____
I.R.S. No. _____
Area/Scope of work _____
Subcontract amount _____

C. Name of M/WBE Firm _____
Address _____
Telephone No. _____
I.R.S. No. _____
Area/Scope of work _____
Subcontract amount _____

D. Name of M/WBE Firm _____
Address _____
Telephone No. _____
I.R.S. No. _____
Area/Scope of work _____
Subcontract amount _____

E. Name of M/WBE Firm _____
Address _____
Telephone No. _____
I.R.S. No. _____
Area/Scope of work _____
Subcontract amount _____

F. Name of M/WBE Firm _____
Address _____
Telephone No. _____
I.R.S. No. _____
Area/Scope of work _____
Subcontract amount _____

(List additional MBE/WBEs, if any, on additional pages and attach to this form)

14. By submitting its bid, Bidder is agreeing it will identify and timely submit within 48 Hours after Bid opening those MBE/WBE subcontractors with dollar amounts and scopes of work, which apply to or exceed the MBE/WBE goals for the Project on the **00450 CREO-KC 08 Contractor Utilization Plan/Request for Waiver.**

15. Bidder agrees that failure to meet or exceed the MBE/WBE Goals for the above project will require the Director of Human Relations to recommend disapproval of the bid unless the Director of Civil Rights and Equal Opportunity finds the Bidder established good faith efforts towards meeting the goals as set forth in the CREO-KC Forms and Instructions for Construction Projects and the City's MBE/WBE Ordinance.

Business Entity Type:

(__) Missouri Corporation
(__) Foreign Corporation
(__) Fictitious Name Registration
(__) Sole Proprietor
(__) Limited Liability Company
(__) Partnership
(__) Joint Venture
(__) Other: (Specify)_____

BIDDER
Legal name & address of Bidder, person firm, partnership, corporation, or association submitting Bid:

_____
Phone No: _____
Cell No: _____
Facsimile No: _____
Bidder's E-Mail: _____

_____
Federal ID. No. _____

I hereby certify that I have authority to execute this document on behalf of Bidder, person, firm, partnership, corporation or association submitting Bid.

By: _____
(Signature)

_____
(Print Name)

Title:_____

Date:_____

(Attach corporate seal if applicable)

NOTARY

Subscribed and sworn to before me this _____ day of _____, 20__.

My Commission Expires: _____ _____

Bidder: _____

ACCEPTANCE OF BID

CITY, by executing this Bid Form/Contract, hereby accepts Bidder's Bid and this Bid Form/Contract that incorporates all other Contract Documents shall constitute the Contract between the Parties.

CITY shall pay CONTRACTOR for completion of the Work in accordance with the Contract Documents a maximum amount of _____ Dollars, ($ _____). The Contract Price includes:

By executing this Bid Form/Contract, CITY accepts Bidder's offer for the Contract Price stated above and this Bid Form/Contract that incorporates all other Contract Documents shall constitute the Contract between the parties

_____

City of Kansas City, Missouri (OWNER or City)

Approved as to form:

_____

Assistant City Attorney

I hereby certify that there is a balance, otherwise unencumbered, to the credit of the appropriation to which the foregoing expenditure is to be charged, and a cash balance, otherwise unencumbered, in the treasury, to the credit of the fund from which payment is to be made, each sufficient to meet the obligation hereby incurred.

_____

Director of Finance (Date)

CITY OF FOUNTAINS
HEART OF THE NATION
KANSAS CITY
MISSOURI

EXPERIENCE AND REFERENCE SUMMARY

Project/Contract Numbers 80002543/9911

Project Title Vertical Wells 2-5 Replacement

Firm's Legal Name	
Mailing Address	
Contact – Name & Email	
Contact – Phone & Fax	

NO.	PROJECT & LOCATION	OWNER NAME & ADDRESS CONTACT & PHONE NUMBER	PROJECT DURATION & DATE COMPLETED	$ VALUE
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				

CITY OF FOUNTAINS
HEART OF THE NATION

KANSAS CITY
MISSOURI

EXPERIENCE AND REFERENCE SUMMARY – CURRENT PROJECTS

Project/Contract Number_____

Project Title _____

Firm's Legal Name	
Mailing Address	
Contact – Name & E-Mail	
Contact – Phone & Fax	

NO.	PROJECT & LOCATION	CONTRACT AMOUNT/ % COMPLETE	OWNER NAME & ADDRESS CONTACT & PHONE NUMBER	LENGTH, DIAMETER & MATERIAL OF CONSTRUCTION OR DESCRIPTION OF REPAIRS	START DATE
1.					
2.					
3.					
4.					
5.					
6.					
7.					

8.					

LIST OF EQUIPMENT AND STAFFING AVAILABLE FOR PROJECT

Project/Contract Numbers 80002543/9911_____

Project Title Vertical Wells 2-5 Replacement_____

	EQUIPMENT AVAILABLE FOR CONSTRUCTION (OR ATTACH LIST)		**STAFFING BREAKDOWN**	**NUMBER OF EACH CATEGORY**
1.		1.	OFFICE STAFF	
2.		2.	SUPERVISORS	
3.		3.	FIELD STAFF – CREW FOREMEN	
4.		4.	FIELD STAFF – OPERATORS (NOT FOREMEN)	
5.		5.	FIELD STAFF – LABORERS (NOT FOREMEN)	
6.		6.		

CITY OF FOUNTAINS
HEART OF THE NATION

KANSAS CITY
MISSOURI

BID BOND

Project/Contract Numbers 80002543/9911_____

Project Title Vertical Wells 2-5 Replacement_____

Bond Number _____

KNOW ALL MEN BY THESE PRESENTS: That _____ of _____, as Principal, and _____ as Surety, hereby bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents unto KANSAS CITY, MISSOURI, a constitutionally chartered municipal corporation, as Obligee, in the sum of

_____Dollars ($_____), lawful money of the United States.

WHEREAS, Principal is herewith submitting its Bid to enter into a contract with Kansas City for the above referenced project,

NOW, THEREFORE the condition of this obligation is such that if the Principal is awarded the contract the Principal will, within the time required, enter into a contract and give a good and sufficient surety bonds to secure the performance of the terms and conditions of the contract and for the prompt payment of all labor and material furnished in the prosecution thereof as required by the contract documents, then this obligation shall be void; otherwise the Principal and Surety will immediately pay unto the Obligee the full amount of this bond as liquidated damages for failure to fulfill the conditions of this obligation, but in no event shall the Surety's liability exceed the penal sum hereof.

Signed, sealed and delivered this _____ day of _____. _____.

BIDDER AND PRINCIPAL

Name, address and facsimile number of Bidder and Principal

_____

_____

_____

_____

I hereby certify that I have authority to execute this document on behalf of Bidder and Principal.

By: _____

Title:_____

(Attach corporate seal if applicable)

SURETY

Name, address and facsimile number of Surety:

_____

_____

_____

_____

I hereby certify that (1) I have authority to execute this document on behalf of Surety; (2) Surety has an A.M. Best rating of A- or better; (3) Surety is 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 (most current revision) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury; and (4) Surety is duly licensed to issue bonds in the State of Missouri and in the jurisdiction in which the Project is located.

By:_____

Title:_____

Date:_____

(Attach seal and Power of Attorney)

CREO KC INSTRUCTIONS

FOR CONSTRUCTION CONTRACTS

PART A. ECONOMIC EQUITY & INCLUSION GOALS--MBE/WBE PROGRAM

I. City's Economic Equity & Inclusion Goals--MBE/WBE Program.

A. The City has adopted an Economic Equity & Inclusion Goals--Minority/Women Business Enterprise ("MBE/WBE") Program (Sections 3-421 through 3-469, Code of Ordinances) (the "Program") to implement the City's policy of supporting the fullest possible participation in City contracts and change orders of firms owned and controlled by minorities and women. Each construction contract may have an MBE and/or WBE goal for participation. An MBE or WBE goal is a numerical objective the City has set for the contract that may be awarded pursuant to these bid specifications. Goals are stated as a percentage of contract dollars. For example, if an MBE goal for a contract is 10% and a Bidder submits a bid of $100,000, the goal for MBE participation would equal $10,000. The specific MBE/WBE goals on this contract are set forth elsewhere in the bid specifications.

B. These Civil Rights & Equal Opportunity Department ("CREO KC") Forms & Instructions are part of the BIDDING DOCUMENTS and CONTRACT DOCUMENTS as defined in the General Conditions. By submitting a Bid, the Bidder agrees, as a material term of the contract, to carry out the City's MBE/WBE Program by making good faith efforts to include certified MBE/WBEs in the contract work to the extent of the goals listed for the contract and to the fullest extent consistent with submitting the lowest and best bid to the City. Bidder agrees that the Program is incorporated into this document and agrees to follow the Program. Although it is not a requirement that a Bidder in fact meet or exceed both the MBE and WBE Goals, it is a requirement for approval of the Bid that a Bidder objectively demonstrate to the City that good faith efforts have been made to meet the Goals. Bidders must attempt to meet both the MBE and WBE goals and request a waiver if either is not met.

C. The following CREO KC Forms are attached and must be used for MBE/WBE submittals:

1. Contractor Utilization Plan/Request for Waiver (CREO KC Form 8); and
2. Letter of Intent to Subcontract (CREO KC Form 00450.01); and
3. Timetable for MBE/WBE Utilization (CREO KC Form 10); and
4. Request for Modification or Substitution (CREO KC Form 11); and
5. Contractor Affidavit for Final Payment (Form 01290.14); and
6. Subcontractor Affidavit for Final Payment (Form 01290.15).

Warning: The City only gives MBE/WBE credit for a Bidder's use of City certified MBE/WBEs. A certified MBE/WBE firm is a firm that has been certified by the City's Civil Rights & Equal Opportunity Department as such. An MBE/WBE firm must be certified before the date on which the contractor utilization plan is due. Certified MBEs and WBEs are listed in the M/W/DBE Kansas City Mo. Online Directory, which is available on the City's website at www.kcmo.org. Before a Bidder submits a bid, Bidder

should contact CREO KC and consult the directory to make sure any firm proposed for use for MBE/WBE participation has been certified.

II. Required Submissions Following Bid Opening.

A. Bidder must submit the following documents within forty-eight (48) hours of bid opening:

1. **Contractor Utilization Plan/Request for Waiver (CREO KC Form 8).** This form states a Bidder's plan to use specific certified MBE/WBEs in the performance of the contract and includes the following:

   a. The work to be performed by each MBE/WBE and the amounts each is to be paid for the work; and

   b. The name, address, race or ethnic origin, gender and employer identification number or social security number of each MBE/WBE that will perform the work.

   c. An automatic request for waiver in the event Bidder has not met or exceeded the MBE and/or WBE goals for the contract but believes that it has made good faith efforts to meet or exceed the goals and desires a waiver of the goals. If a waiver is requested, CREO KC will examine the Bidder's documentation of good faith efforts and make a recommendation to grant or deny the waiver. CREO KC will recommend a waiver be granted only if the Bidder has made good faith efforts to obtain MBE/WBE participation.

2. **Letter(s) of Intent to Subcontract (CREO KC Form 00450.01)**. A letter must be provided from each MBE/WBE listed on the Contractor Utilization Plan. These letters verify that the MBE/WBE has agreed to execute a formal agreement for the work and indicate the scope of work to be performed and the price agreed upon for the work.

III. Required Submission when Requested by City.

A. Bidder must submit the following documents when requested by City:

1. **Timetable for MBE/WBE Utilization (CREO KC Form 10).**

2. **Documentation of good faith efforts.**

IV. Required Monthly Submissions during term of Contract.

A. Bidder must submit the following report on a monthly basis if awarded the contract:

1. **M/WBE Monthly Utilization Report.** This report must be submitted to the Director by the 15th of each month. Failure to submit timely reports may result in delays in processing of current and future contract approvals and payment applications. The method of submission of this report is through the B2GNow Diversity Management System (B2GNow).

V. Required Submittals for Final Contract Payment.

A. Contractor must submit the following documents with its request for final payment under

the contract:

1. **Contractor Affidavit for Final Payment (Form 01290.14)**
2. **Subcontractor Affidavit(s) for Final Payment (Form 01290.15)**
3. **Final B2GNow Monthly Contract Audit Report with all payment audits confirmed.**

VI. Additional Submittals.

A. Contractor may be required to make additional submittals during the term of the Contract, including **Request for Modification or Substitution (CREO KC Form 11)**. Refer to Section IX, Modification of the Contractor Utilization Plan or Substitution of an MBE/WBE, for additional instructions on when this form must be submitted.

VII. MBE/WBE Participation Credit.

A. The following shall be credited towards achieving the goals:

1. The total contract dollar amount that a prime contractor has paid or is obligated to pay to a subcontractor that is a certified MBE or WBE, except as otherwise expressly provided for herein.
2. The total contract dollar amount that a prime contractor that is a certified MBE or WBE performed itself.
3. Sixty percent (60%) of the total dollar amount paid or to be paid by a prime contractor to obtain supplies or goods from a supplier who is a certified MBE or WBE.
4. Ten percent (10%) of the total dollar amount paid or to be paid by a prime contractor to obtain supplies or goods from a supply broker who is a certified MBE or WBE.
5. One hundred percent (100%) of the total dollar amount paid or to be paid by a prime contractor to a manufacturer of construction supplies who is a certified MBE or WBE.
6. Subcontractor participation with a lower tier MBE/WBE subcontractor using one of the above methods of participation.

B. **NO CREDIT**, however, will be given for the following:

1. Participation in a contract by a MBE or WBE that does not perform a commercially useful function as defined by the Program; and
2. Any portion of the value of the contract that an MBE or WBE subcontractor subcontracts back to the prime contractor or any other contractor who is not a qualified MBE/WBE; and
3. Materials and supplies used on the contract unless the MBE/WBE is responsible for negotiating the price, determining quality and quantity, ordering the materials and installing (where applicable) and paying for material itself; and
4. Work performed by an MBE or WBE in a scope of work other than that in which the MBE or WBE is currently certified.

VIII. Methods for Securing Participation of MBE/WBEs and Good Faith Efforts.

A. A bidder is required to make good faith efforts to achieve the MBE/WBE goals. Good faith efforts are efforts that, given all relevant circumstances, a Bidder actively and aggressively seeking to meet the goals can reasonably be expected to make. Good faith efforts must be made before the Bidder submits a Contractor Utilization Plan, in other words, within 48 hours of bid opening. However, efforts made to increase participation of MBEs and WBEs following submission of the CUP can be considered as evidence of good faith efforts to meet the goals.

B. In evaluating good faith efforts, the Director of CREO KC will consider whether the Bidder has performed the following, along with any other relevant factors:

1. Advertised for at least 15 calendar days prior to the bid or proposal due date opportunities to participate in the contract in general circulation media, trade and professional association publications, small and minority business media, and publications of minority and women's business organizations which are included in a list along with their current contact information identified on the directory as the list of publications available to publish such advertisements, which list shall be updated by CREO KC no less than every three (3) month.

2. Sent written notices at least fifteen (15) calendar days prior to the bid or proposal due date containing the information required in section (9) below, by certified mail, e-mail, or facsimile, to at least 80% of MBEs and WBEs which are included in a list along with their contact information identified on the directory as the list of organizations available to receive such notices, which list shall be updated by CREO KC no less than every three (3) months.

3. Sent written notices, containing the information required by section (9) below, by certified mail, e-mail or facsimile, to at least 80% of MBEs and WBEs listed on the directory certified in the applicable scopes of work for the particular bid soliciting their participation in the contract at least 15 calendar days prior to the bid or proposal due date.

4. Attempted to identify portions of the work for qualified MBE and/or WBE participation in order to increase the likelihood of meeting the goals, including breaking down contracts into economically feasible units that take into consideration the capacity of available MBE/WBEs appearing on the CREO KC directory.

5. At any time prior to submission of the CUP or submittal of a request for modification of a CUP, requested assistance in achieving the goals from the Director and acted on the Director's recommendations.

6. Conferred with certified MBEs and WBEs which inquired about or responded to the bid solicitation and explained to such MBEs and WBEs the scope and requirements of the work for which their bids or proposals were solicited, and if not all certified MBEs and WBEs in the particular scopes listed on the directory have inquired about or responded to the bid solicitation for each scope of work, then contact by certified mail, e-mail or telephone the greater of ten (10) or 80% of additional certified MBEs and WBEs in the particular scopes of work listed on the directory and offer to confer with such MBEs and WBEs for such particular scope of work and request such MBEs

and WBEs to submit a proposal.

7. Attempted to negotiate in good faith with certified MBEs and WBEs which responded to the bid solicitation or those certified MBEs and WBEs that were conferred with as contemplated in section (6) above, and other qualified MBEs and WBEs, at the option of the bidder, proposer, or contractor, as applicable, to perform specific subcontracts, not rejecting them as unqualified without sound reasons based on a thorough investigation of their capabilities by the bidder, proposer, or contractor; in the event an MBE or WBE is the low bid, but rejected as unqualified, the bidder, proposer, or contractor and the director or board, as applicable, shall provide sound reasons for rejecting such MBE or WBE.
8. Attended pre-bid meeting when such meetings were indicated in the solicitation of bids or otherwise by the bidder, proposer, or contractor, as applicable or by the director provided the director provides written direction to the bidder, proposer, or contractor at the time the goals are recommended.
9. Written notices and advertisements to be provided pursuant to sections (1), (2) and (3) above shall include the following information:
    a. The bid due date;
    b. The name of the project;
    c. The address or general location of the project;
    d. The location of plans and specifications for viewing;
    e. Contact information of the prime contractor;
    f. A general description of the scopes of work that are the subject of the solicitation;
    g. The goals established for the applicable contract, and if the goals are still subject to board approval, then a statement that the goals as stated are preliminary and are subject to board approval;
    h. If the project or any portion of the project is subject to prevailing wage then a statement that all or a portion of the project will be subject to prevailing wage, as applicable; and if only a portion of the scopes are subject to prevailing wage, then identification of such scopes provided that such scopes are known as of the time of bid solicitation;
    i. The date and time of any pre-bid meeting(s), if any, which have been scheduled by the bidder, proposer, contractor or developer as of the bid solicitation; and

    Any other information deemed relevant by the bidder, proposer, contractor or developer, as applicable, or the director to the extent the director provides written direction to the bidder, proposer, contractor or developer of such additional information at the time the goals are recommended by the director. 8. Within five (5) working days after drawing the bid specifications, sent certified letters, verifiable e-mails or proof of facsimiles to certified MBEs and WBEs listed in the M/W/DBE Kansas City Mo. Online Directory.

C. A Bidder may be required to give the City documentation to prove that it made good faith efforts. The Bidder will be contacted by the City with further instructions about when this documentation must be submitted.

IX. Modification of the Contractor Utilization Plan or Substitution of an MBE/WBE.

A. After bid opening, a Bidder or Contractor may need to substitute an MBE and/or WBE or request that the amount of MBE/WBE participation listed in its Contractor Utilization Plan be modified. Bidder or Contractor must file a **Request for Modification or Substitution (CREO KC Form 11) prior to actual substitution and within a reasonable time after learning that a modification or substitution is necessary.** The Director may approve substitutions or modifications and upon approval, the modifications and substitutions will become an amendment to the Contractor Utilization Plan. Modifications or substitutions may be approved when:

1. The Director finds that the Bidder or Contractor made and provided evidence of good faith efforts to substitute the MBE/WBE listed on the Contractor Utilization Plan with other certified MBE/WBEs for the scope of work or any other scope of work in the contract; and
2. The Bidder or Contractor has not attempted intentionally to evade the requirements of the program and it is in the best interests of the City to allow a modification or substitution; and
3. The Director also finds one of the following:
    a. The listed MBE/WBE is non-responsive or cannot perform; or
    b. The listed MBE/WBE has increased its previously quoted price to the bidder, proposer or contractor without a corresponding change in the scope of the work; or
    c. The listed MBE/WBE has committed a material default or breach of its contract with the contractor; or
    d. Requirements of the scope of work of the contract have changed and render subcontracting not feasible or not feasible at the levels required by the goals established for the contract; or
    e. The listed MBE/WBE is unacceptable to the contracting department; or
    f. The listed MBE/WBE thereafter had its certification revoked; or

B. A modification shall not be made unless the modification or substitution has first been requested and approved by the Director. Once a modification has been made, a Construction Contractor Employee Identification Report (CREO KC Form 0485.04) for the newly approved subcontractor must be submitted at least ten (10) days prior to the approved subcontractor commencing work on a City contract.

X. Appeals.

A. In conformance with the Act, appeals may be made to the City Fairness in Construction Board or Fairness in Professional Services and Goods Board on the following:

1. The grant or denial of a Request for Waiver;
2. Substitution for an MBE/WBE listed on a Contractor Utilization Plan;
3. Modification of the percentage of MBE/WBE participation on a Contractor Utilization Plan;
4. Liquidated Damages;
5. The amount of MBE/WBE credit the Contractor may receive for MBE/WBE participation identified in the contractor utilization plan.

B. Any appeal must be filed in writing with the Director within fifteen (15) calendar days of notice of the determination. Mailing, faxing, personal delivery or posting at CREO KC of determinations shall constitute notice. The appeal shall state with specificity why the Bidder or Contractor believes the determination is incorrect

C. Failure to file a timely appeal shall constitute a waiver of a Bidder's or Contractor's right to appeal such determination and such person shall be estopped to deny the validity of any determination which could have been timely appealed.

XI. Access to Documents and Records.

A. By submitting a Bid, each Bidder agrees to permit the City, its duly authorized agents or employees, access at all reasonable times to all books and business records of Bidder as may be necessary to ascertain compliance with the requirements of this document and the Act, within ten (10) calendar days of the date of the written request.

B. All Bidders agree to cooperate with the contracting department and CREO KC in studies and surveys regarding the MBE/WBE program.

XII. Miscellaneous.

A. A Bidder or Contractor shall bear the burden of proof with regard to all issues on appeal.

B. In the event of any conflict between this document and the Program, the provisions of the Program shall control. The terms used in this document are defined in the Program.

C. Oral representations are not binding on the City.

D. The City Council may waive the requirements of this document and the Program and award the contract to the lowest and best bidder if the City Council determines a waiver is in the best interests of the City.

E. The Director may grant extensions of time to Bidders to submit Letters of Intent to Subcontract (CREO KC Form 00450.01).

XIII. Liquidated Damages – Economic Equity & Inclusion Goals--MBE/WBE Program.

A. If Contractor fails to achieve the MBE/WBE goals stated in its Contractor Utilization Plan, as amended, the City will sustain damages, the exact extent of which would be difficult or impossible to ascertain. Therefore, in order to liquidate those damages, the monetary difference between either (1) the amount of the MBE/WBE goals set forth in the Contractor Utilization Plan, as amended, or (2) the goals established (whichever is lower) and the amount actually paid to qualified MBEs and WBEs for performing a commercially useful function will be deducted from the Contractor's payments as

liquidated damages. In determining the amount actually paid to qualified MBEs and WBEs, no credit will be given for the portion of participation that was not approved by the Director, unless the Director determines that the Contractor acted in good faith. No deduction for liquidated damages will be made when, for reasons beyond the control of the Contractor, the MBE/WBE participation stated in the Contractor Utilization Plan, as amended and approved by the Director is not met.

PART B. CONSTRUCTION EMPLOYMENT PROGRAM REQUIREMENTS

IMPORTANT: This Part B is applicable to City construction contracts estimated by the City prior to solicitation as: (1) requiring more than 800 construction labor hours and (2) valued in excess of $300,000.00. This program is distinguished from the M/WBE Program in that it is based on workforce hours of the Bidder and *all* its participating subcontractors rather than the actual contract value of work. The instructions herein detail the specifics related to this program. This program is in *addition* to the M/WBE program.

I. City's Construction Employment Program.

A. The City has adopted a Construction Employment Program (Sections 3-501 through 3-525, Code of Ordinances) (the "Workforce Program" or "Program") to implement the City's policy of supporting the fullest possible utilization of minority and women workers in the construction industry.

B. The minimum workforce goals are currently set by ordinance at 10% for minorities and 2% for women. These goals are separate from M/WBE goals. Public recognition may be provided if the bidder achieves at least twice the minimum participation.

C. Construction contracts subject to the Workforce Program and the company-wide and project-specific workforce goals ("workforce goals") are those contracts to construct, reconstruct, improve, enlarge or alter any fixed work that is estimated by the City prior to solicitation to: (1) require more than 800 construction labor hours, (2) has estimated costs that exceed $300,000.00, and (3) involve the expenditure of public funds.

D. The successful bidder may meet company-wide goals by counting the bidder's utilization of minorities and women throughout the Kansas City metropolitan statistical area. In addition, the successful Bidder is responsible to ensure that it and its subcontractors cumulatively make good faith efforts to meet project-specific goals for utilization of minorities and women.

E. These Civil Rights & Equal Opportunity Department ("CREO KC") Forms & Instructions are part of the BIDDING DOCUMENTS and CONTRACT DOCUMENTS as defined in the General Conditions. By submitting a Bid, the Bidder agrees, as a material term of the contract, to carry out the City's Construction Employment Program by making good faith efforts to utilize minority and women workers to the fullest extent consistent with submitting the lowest and best bid to the City. Bidder agrees that the Program is incorporated into this document and agrees to follow the Program. Although it is not a requirement that a Bidder in fact meet or exceed the construction employment goals to receive approval from CREO KC, a Bidder not doing so is required to

objectively demonstrate to CREO KC that good faith efforts have been made.

F. The following reports are to be used for Construction Employment Program submittals:

1. Project Workforce Monthly Report
2. Company-Wide Workforce Monthly Report

II. Required Submissions.

A. Within forty-eight (48) hours after bid opening, the construction contractor shall submit the **Construction Employee Identification Report** (CREO KC Form 00485.04) and shall include: the name, home address, job title, sex and race/ethnicity of each person working for the Prime. The individuals to be listed on the form are those which the construction contractor *anticipates* will be performing construction labor hours creditable towards the minimum workforce goals applicable to the construction contractor individually.

The following circumstances also require the submission of a Construction Employee Identification Report:

a. Prior to contract execution for those City construction contracts awarded pursuant to a request for proposals (RFP), the construction contractor shall submit a **Construction Employee Identification Report** (CREO KC Form 00485.04).

b. At least ten (10) days prior to the date upon which any subcontractor is to commence work under a City construction contract, the Prime shall submit a **Construction Employee Identification Report** (CREO KC Form 00485.04) for the subcontractor.

B. The CREO KC Director has established the B2GNow Diversity Management System ("B2GNOW") (an online reporting tool) as the preferred method for fulfilling reporting requirements of the Workforce Program. The CREO KC Director will allow paper submission in lieu of on-line submission if the on-line submission process presents a hardship to the contractor.

C. Bidder must submit the following documents through B2GNow on a monthly basis if awarded the contract:

1. **Project Workforce Monthly Report.** This report is contract specific. This report must be submitted to the Director by the 15th of each month for the Contractor and each subcontractor. It will be utilized to report the Contractor's own workforce compliance data with regard to the City's construction contract. Failure to submit timely reports may result in delays in processing of current and future contract approvals and payment applications.

2. **Company-Wide Workforce Monthly Report.** This report is not contract specific; it is used to report on the utilization of women and minorities, by trade, company-wide. This report must be submitted to the Director by the 15th of each month. It will be utilized to report the Contractor's own workforce compliance data with regard to

every contract (both privately and publicly funded) that the Contractor has in progress throughout the Kansas City Metropolitan Statistical Area. Failure to submit timely reports may result in delays in processing of current and future contract approvals and payment applications.

III. Submittal Required for Final Contract Payment.

A. The final Project Workforce Monthly Report(s) and Company-Wide Workforce Monthly Report must be submitted before final payment will be made and/or retainage released. Contractor shall note the submittal of the final reports by notation in the box entitled "Final Report"

IV. Methods for Securing Workforce Participation and Good Faith Efforts.

A. A bidder is required to make good faith efforts to achieve the construction employment goals and ensure its subcontractors are making good faith efforts to achieve the construction employment goals. If a Bidder or its subcontractors will be unable to secure enough minority and female participation to meet or exceed the construction employment goals, a bidder must, within a reasonable time after so learning, request a waiver or modification of the goals by the Director of CREO KC. The Director will request evidence of the Bidder's and its' subcontractors' good faith efforts to meet the goals. The Director will examine the Bidder's request and the Bidder's documentation of good faith efforts for itself and its subcontractors. The Director will examine the Bidder's request and the Bidder's documentation of good faith efforts and grant or deny a waiver or modification. The Director will grant a waiver or modification only if the Bidder has made good faith efforts to secure minority and female participation.

IMPORTANT: The Bidder's subcontractors on a city construction contract must meet the workforce goals collectively. The bidder is responsible to ensure the subcontractors make good faith efforts to meet the workforce goals. Bidders are required to include language in its subcontracts that ensure the subcontractors make good faith efforts to meet or exceed the workforce goals.

B. In evaluating good faith efforts, the Director will consider whether the Bidder and its subcontractors have performed the following:

1. For those bidders that are not signatories to a collective bargaining agreement with organized labor:

    a. Requested in writing the assistance of the Director with respect to efforts to promote the utilization of minorities and women in the workforce and acted upon the Director's recommendations; and

    b. Advertised in minority or women trade association newsletters and/or minority or women owned media at least 15 calendar days prior to the utilization of any construction services on the city construction contract and used terminology that sufficiently describes the work available, the pay scale, the application process, and anything else that one might reasonably be expected to be informed of relevant to the position being advertised; and

    c. Maintained copies of each advertisement and a log identifying the publication and date of publication; and

d. Conducted real and substantial recruitment efforts, both oral and written, targeting resident, minority and women community-based organization, schools with a significant minority student population, and training organizations serving the recruitment area; and

e. Established and maintained a current list of resident, minority and women recruitment sources, providing written notification to the recruitment sources of available employment opportunities, and maintained records of the notices submitted to the organizations and any responses thereto; and

f. Maintained a current file for the time period of the city construction contract with the name, address, and telephone number of each resident, minority and woman job applicant, the source of the referral, whether or not the person was hired, and in the event that the applicant was not hired, the reason therefore; and

g. Promoted the retention of minorities and women in its workforce with the goals of achieving sufficient annual hours for minorities and women to qualify for applicable benefits; and

h. Required by written contract that all subcontractors comply with the above efforts.

2. For those bidders that are signatories to collective bargaining agreements with organized labor:

a. Requested in writing from each labor union representing crafts to be employed that:

i. the labor union make efforts to promote the utilization of residents of the City, minorities and women in the workforce; and

ii. the labor union identify any residents of the City, minorities and women in its membership eligible for employment; and

b. Collaborated with labor unions in promoting mentoring programs for journeypersons intended to assist minorities and women in increasing retention with the goals of achieving sufficient annual hours to qualify for applicable benefits; and

c. Maintained a current file with the name, address, and telephone number of each resident, minority and women worker identified by the labor union, whether or not the person was hired, and in the event the person was not hired, the reason therefore.

d. To the extent the good-faith efforts applicable to bidders that are signatories to collective bargaining agreements with organized labor conflict with the procedures implemented by the bidder in order to comply with the relevant bargaining agreement, the bidder shall substitute other procedures as may be approved by the Director in writing, in order to accomplish the purpose and intent of this section.

C. In the event workforce goals are not met or there is anticipation that goals will not be

met, a Bidder will be required to give the City documentation to prove that it and/or it's subcontractors made good faith efforts. The Bidder will be contacted by the City with further instructions about when this documentation must be submitted.

V. Access to Documents and Records.

A. By submitting a Bid, each Bidder agrees to permit the City, its duly authorized agents or employees, access at all reasonable times to all books and business records of Bidder as may be necessary to ascertain compliance with the requirements of this document and the Program, within ten (10) days of the date of the written request. Each bidder further agrees to require, if awarded the contract, that every subcontractor permit the City the same access to documents and records.

B. All Bidders agree to cooperate with the contracting department and CREO KC in studies and surveys regarding the construction employment program.

VI. Appeals.

A. In conformance with the Program, appeals may be made to the Construction Workforce Board on the following:

1. Determinations by the Director that a contractor did not meet the construction employment goals and did not make a good faith effort to meet the goals;
2. Recommendations by the Director to assess liquidated damages;
3. Recommendation by the Director that a contractor be declared ineligible to receive any city construction contract for a period of time up to one year.

B. Any appeal must be filed in writing with the Director within ten (10) working days of notice of the recommendation or determination. The appeal shall state with specificity why the Bidder or Contractor believes the recommendation or determination is incorrect.

C. Failure to file a timely appeal shall constitute a waiver of a Bidder's or Contractor's right to appeal such determination or recommendation and such person shall be estopped to deny the validity of any order, determination, recommendation or action of CREO KC which could have been timely appealed.

VII. Miscellaneous.

A. A Bidder or Contractor shall bear the burden of proof with regard to all issues on appeal.

B. The successful bidder may be required to meet with the Director of CREO KC or the Director's designee for the purpose of discussing the construction employment program, the bidder's efforts to realize the goals, and any other problems and/or issues affecting the realization of the goals or the program in general.

C. In the event of any conflict between this document and the Program, the provisions of the Program shall control. The terms used in this document are defined in the Program.

D. Oral representations are not binding on the City.

VIII. Failure to Meet Workforce Goals

A. If Contractor or its subcontractors fail to achieve the construction employment goals or make good faith efforts to achieve those goals without having previously obtained a

waiver or modification of those goals, the City will sustain damages, the exact extent of which would be difficult or impossible to ascertain. These damages are magnified if the failure to abide by the requirements of the Workforce Program is recurring. Therefore, if the directory finds that the contractor or subcontractor have not met, or made good faith efforts to meet, the construction employment goals for any quarter, the director may:

1. Assess liquidated damages against the construction contractor, as specified in the city construction contract;
2. Require the contractor to attend mandatory training, as specified in the construction contract;
3. Declare the contractor ineligible to receive any city construction contract or participate as a subcontractor under any city construction contract for a period of time up to six months, as specified in the construction contract.

IX. First Source Program

A. The City has established a labor force recruiting program intended to assist contractors in identifying, interviewing and hiring qualified job applicants residing in Kansas City, Missouri. While the contractor awarded a City construction contract is not prohibited from hiring persons residing outside Kansas City, Missouri, the recruiting resource provided for herein (the "First Source Program") must be utilized by the contractor subject to the construction employment goals as set forth in this **PART B, CONSTRUCTION EMPLOYMENT PROGRAM REQUIREMENTS**.

B. The City utilizes the services of the Full Employment Council, Inc., to administer the First Source Program. The contractor shall contact the Full Employment Council within 48 hours of contract award, regardless of whether the contractor has any hiring needs at that time, and within 48 hours following any job vacancy which the contractor reasonably anticipates filling during the term of the City construction contract. The contractor shall comply with the First Source Program requirements as implemented by the Full Employment Council unless otherwise excused in writing by the Director of CREO KC for good cause shown. To ensure compliance with the First Source Program, the contractor shall contact those persons at the Full Employment Council responsible for administering the program, which may be identified by visiting their website at www.feckc.org and clicking on the link for KCMO First Source Hiring Program. The contractor shall not hire any individual to provide construction services on a City construction contract unless the contractor has met the requirements of the First Source Program.

C. The contractor shall require that its subcontractors utilize the First Source Program to the same extent that the contractor is required to do so, and shall incorporate the requirements of this Section IX into every subcontract. Every subcontractor shall be required to contact the Full Employment Council within 48 hours of subcontract award, regardless of whether the subcontractor has any hiring needs at that time, and within 48 hours following any job vacancy which the subcontractor reasonably anticipates filling during the term of their subcontract on a City construction project.

CONTRACTOR UTILIZATION PLAN/REQUEST FOR WAIVER

Project Number 80002543/9911

Project Title Vertical Wells 2-5 Replacement

_____ _____
(Department Project) Department

_____
(Bidder/Proposer)

STATE OF_____)
) ss
COUNTY OF_____)

I,_____, of lawful age and upon my oath state as follows:

1. This Affidavit is made for the purpose of complying with the provisions of the MBE/WBE submittal requirements on the above project and the MBE/WBE Program and is given on behalf of the Bidder/Proposer listed below. It sets out the Bidder/Proposer's plan to utilize MBE and/or WBE contractors on the project.

2. The project target goals are_____**% MBE** and_____**% WBE.**

3. Bidder/Proposer assures that it will utilize a minimum of the following percentages of MBE/WBE participation in the above project:

   - **BIDDER/PROPOSER PARTICIPATION:_____% MBE_____% WBE**

   - **POST-BID/POST-RFP ESTIMATED BUDGET: $_____**

4. The following are the M/WBE subcontractors whose utilization Bidder/Proposer warrants will meet or exceed the above-listed Bidder/Proposer Participation. Bidder/Proposer warrants that it will utilize the M/WBE subcontractors to provide the goods/services described in the applicable Letter(s) of Intent to Subcontract, copies of which shall collectively be deemed incorporated herein). ***(All firms must currently be certified by Kansas City, Missouri)***

   - Name of M/WBE Firm _____
     Address_____
     Telephone No. _____
     I.R.S. No. _____

Name of M/WBE Firm _____
Address _____
Telephone No. _____
I.R.S. No. _____

Name of M/WBE Firm _____
Address _____
Telephone No. _____
I.R.S. No. _____

Name of M/WBE Firm _____
Address _____
Telephone No. _____
I.R.S. No. _____

Name of M/WBE Firm _____
Address _____
Telephone No. _____
I.R.S. No. _____

Name of M/WBE Firm _____
Address _____
Telephone No. _____
I.R.S. No. _____

(List additional M/WBEs, if any, on additional page and attach to this form)

4. The following is a breakdown of the percentage of the total contract amount that Bidder/Proposer agrees to pay to each listed M/WBE:

MBE/WBE BREAKDOWN SHEET

MBE FIRMS:

Name of MBE Firm	Supplier/Broker/Contractor	Subcontract Amount*	Weighted Value**	% of Total Contract

TOTAL MBE $ / TOTAL MBE %: $_____ _____%

WBE FIRMS:

Name of WBE Firm	Supplier/Broker/Contractor	Subcontract Amount*	Weighted Value**	% of Total Contract

TOTAL WBE $ / TOTAL WBE %: $_____ _____%

*"Subcontract Amount" refers to the dollar amount that Bidder/Proposer has agreed to pay each M/WBE subcontractor as of the date of contracting and is indicated here solely for the purpose of calculating the percentage that this sum represents in proportion to the total contract amount. Any contract amendments and/or change orders changing the total contract amount may alter the amount due an M/WBE under their subcontract for purposes of meeting or exceeding the Bidder/Proposer participation.

**"Weighted Value" means the portion of the subcontract amount that will be credited towards meeting the Bidder/Proposer participation. See CREO KC Forms and Instructions for allowable credit and special instructions for suppliers.

5. Bidder/Proposer acknowledges that the monetary amount to be paid each listed M/WBE for their work, and which is approved herein, is an amount corresponding to the percentage of the total contract amount allocable to each listed M/WBE as calculated in the MBE/WBE Breakdown Sheet. Bidder/Proposer further acknowledges that this amount may be higher than the subcontract amount listed therein as change orders and/or amendments changing the total contract amount may correspondingly increase the amount of compensation due an M/WBE for purposes of meeting or exceeding the Bidder/Proposer participation

6. Bidder/Proposer acknowledges that it is responsible for considering the effect that any change orders and/or amendments changing the total contract amount may have on its ability to meet or exceed the Bidder/Proposer participation. Bidder/Proposer further acknowledges that it is responsible for submitting a Request for Modification or Substitution if it will be unable to meet or exceed the Bidder/Proposer participation set forth herein.

7. If Bidder/Proposer has not achieved both the M/WBE goal(s) set for this Project, Bidder/Proposer hereby requests a waiver of the MBE and/or WBE goal(s) that Bidder/Proposer has failed to achieve

8. Bidder/Proposer will present documentation of its good faith efforts, a narrative summary detailing its efforts and the reasons its efforts were unsuccessful when requested by the City.

9. I hereby certify that I am authorized to make this Affidavit on behalf of the Bidder/Proposer named below and who shall abide by the terms set forth herein:

Bidder/Proposer primary contact: _____
Address: _____
_____
Phone Number: _____
Facsimile number: _____
E-mail Address: _____

By: _____
Title: _____
Date: _____
(Attach corporate seal if applicable)

Subscribed and sworn to before me this_____day of_____, 20____.

My Commission Expires: _____ _____
Notary Public

LETTER OF INTENT TO SUBCONTRACT

Check one:
Original LOI: ☐
Updated LOI: ☐

Project Name/Title _____

Project Location/Number 80002543/9911

PART I: Prime Contractor_____agrees to enter into a contractual agreement with M/W/DBE Subcontractor_____who will provide the following goods/services in connection with the above-reference contract: [Insert a brief narrative describing goods/services to be provided. Broad Categorizations (e.g., "electrical," "plumbing," etc.) or the listing of NAICS Codes in which M/W/DBE Subcontractor is certified are insufficient and may result in denial of this Letter of Intent to Subcontract.]

_____

_____

_____

for an estimated amount of $_____(or_____% of the total estimated contract value.)

M/WBE Vendor type:

☐ Subcontractor/manufacturer (counts as 100% of contract value towards goals)
☐ Supplier (counts as 60% of the total dollar amount paid or to be paid by a prime contractor for supplies or goods towards goals)
☐ Broker (counts as 10% of the total dollar amount paid or to be paid by a prime contractor for supplies or goods towards goals)

M/W/DBE Subcontractor is, to the best of Prime Contractor's knowledge, currently certified with the City of Kansas City's Civil Rights & Equal Opportunity Department to perform in the capacities indicated herein. Prime Contractor agrees to utilize M/W/DBE Subcontractor in the capacities indicated herein, and M/W/DBE Subcontractor agrees to work on the above-referenced contract in the capacities indicated herein, contingent upon award of the contract to Prime Contractor.

PART 2: This section is to be completed by the M/W/DBE subcontractor listed above. Please attach additional sheets as needed for more than one intended sub-tier contract. **IMPORTANT: Falsification of this document will result in denial and other remedies available under City Code.**

Select one:

☐ The M/W/DBE Subcontractor listed above **IS NOT** subcontracting any portions of the above-stated scope of work(s). (Continue to Part 3.)

☐ The M/W/DBE Subcontractor listed above **IS** subcontracting certain portions of the above stated scope of work(s) to:

(1) Company name: _____

Full address: _____
Street number and name City, State and Zip Code

Primary contact: _____
Name Phone

a) This subcontractor is (select one): ☐MBE ☐WBE ☐DBE ☐N/A

i: If this subcontractor is an M/W/DBE certified with the City of Kansas City, Missouri, a separate Letter of Intent must be attached to this document.

ii. If this subcontractor is NOT a certified M/W/DBE certified with the City of Kansas City, Missouri, the firm must still be listed for reporting purposes but a Letter of Intent is not required.

b) Scope of work to be performed: _____

c) The dollar value of this agreement is: _____

PART 3:

NOTE: SIGNATURES AND NOTARIZATIONS REQUIRED FOR NEW LETTERS OF INTENT (LOI); SIGNATURES ONLY FOR UPDATED LOI (ADDING VALUE TO EXISTING CONTRACT).

PRIME CONTRACTOR BUSINESS NAME: _____

_____ _____

Signature: Prime Contractor Print Name

_____ _____

Title Date

State of)

County of)

I,_____, state that the above and foregoing is based on my best knowledge and belief.

Subscribed and sworn to before me, a notary public, on this day of_____, 20_____

My Commission Expires: _____ _____

Notary Public

STAMP:

MWDBE SUBCONTRACTOR BUSINESS NAME: _____

_____ _____

Signature: Subcontractor Print Name

_____ _____

Title Date

State of)

County of)

I,_____, state that the above and foregoing is based on my best knowledge and belief.

Subscribed and sworn to before me, a notary public, on this day of_____, 20_____

My Commission Expires: _____ _____

Notary Public

STAMP:

TIMETABLE FOR MBE/WBE UTILIZATION

(This form should be submitted to the City after contract award.)

I, _____, acting in my capacity as _____
(Name) *(Position with Firm)*
of _____, with the submittal of this Timetable, certify that
(Name of Firm)
the following timetable for MBE/WBE utilization in the fulfillment of this contract is correct and true to the best of my knowledge.

ALLOTTED TIME FOR THE COMPLETION OF THIS CONTRACT
(Check one only)

15 days	___	75 days	___	135 days	___
30 days	___	90 days	___	150 days	___
45 days	___	105 days	___	165 days	___
60 days	☐	120 days	☐	180 days	☐

Other _____ (Specify)

Throughout _____ Beginning 1/3 _____
Middle 1/3 _____ Final 1/3 _____
Beginning 1/3 _____% Middle 1/3 _____% Final 1/3 _____%

PLEASE NOTE: Any changes in this timetable require approval of the Civil Rights & Equal Opportunity Department in advance of the change.

If you have any questions regarding the completion of this form, please contact the Civil Rights & Equal Opportunity Department at: (816) 513-1836**.**

_____
(Signature)

_____
(Position with Firm)

_____
(Date)

REQUEST FOR MODIFICATION OR SUBSTITUTION

*(This Form **must** be submitted to CREO KC to request substitutions for an MBE/WBE listed in the Contractor Utilization Plan or for modification of the amount of MBE/WBE participation listed in the Contractor Utilization Plan. This Form shall be an amendment to the Contractor Utilization Plan.)*

BIDDER/PROPOSER/CONTRACTOR: _____
ADDRESS: _____
PROJECT NUMBER OR TITLE: _____
AMENDMENT/CHANGE ORDER NO: (if applicable) _____

Project Goals:	_____% MBE	_____% WBE
Contractor Utilization Plan:	_____% MBE	_____% WBE

1. I am the duly authorized representative of the above Bidder/Contractor/Proposer and am authorized to request this substitution or modification on behalf of the Bidder/Contractor/Proposer.

2. I hereby request that the Director of CREO KC recommend or approve: (check appropriate space(s))

   a. ☐ A substitution of the certified MBE/WBE firm _____,
   (Name of new firm)
   to perform _____,
   (Scope of work to be performed by new firm)

   for the MBE/WBE firm _____ which is currently
   (Name of old firm)
   listed on the Bidder's/Contractor's/Proposer's Contractor Utilization Plan to

   perform the following scope of work: _____.
   (Scope of work of old firm)

   b. ☐ A modification of the amount of MBE/WBE participation currently listed on the Bidder's/Contractor's/Proposer's Contractor Utilization Plan from

   _____ % MBE_____% WBE *(Fill in % of MBE/WBE Participation currently listed on Contractor Utilization Plan)*

   TO

   _____% MBE _____% WBE *(Fill in New % of MBE/WBE Participation requested for Contractor Utilization Plan)*

   c. Attach 00450.01 Letter of Intent to Subcontract letter for each new MBE/WBE to be added.
   d. Attach a copy of the most recent 00485.01 or on-line M/WBE Monthly Utilization Report

3. Bidder/Contractor/Proposer states that a substitution or modification is necessary because: (check applicable reason(s))

☐ The MBE/WBE listed on the Contractor Utilization Plan is non-responsive or cannot perform.

☐ The MBE/WBE listed on the Contractor Utilization Plan has increased its previously quoted price without a corresponding change in the scope of work.

☐ The MBE/WBE listed on the Contractor Utilization Plan has committed a material default or breach of its contract.

___ Requirements of the scope of work of the contract have changed and make subcontracting not feasible or not feasible at the levels required by the goals established for the contract.

___ The MBE/WBE listed on the Contractor Utilization Plan is unacceptable to the City contracting department.

___ Bidder/Contractor/Proposer has not attempted intentionally to evade the requirements of the Act and it is in the best interests of the City to allow a modification or substitution.

4. The following is a narrative summary of the Bidder's/Contractor's/Proposer's good faith efforts exhausted in attempts to substitute the MBE/WBE firm named above which is currently listed on the Contractor Utilization Plan with other qualified, certified MBE/WBE firms for the listed scope of work or any other scope of work in the project:

5. Bidder/Proposer/Contractor will present documentation when requested by the City to evidence its good faith efforts.

Dated:_____ _____
(Bidder/Proposer/Contractor)

_____
By: (Authorized Representative)

CREO KC MONTHLY REPORTING INSTRUCTIONS

M/WBE Monthly Utilization Report Instructions

1. MBE/WBE Reporting applies to Contracts that have approved MBE/WBE goals assigned.
2. The City will utilize a web-based MBE/WBE Reporting System in the administration of this Contract. This web-based application database is a collaboration tool selected and provided by the City, which will allow Contractors and Consultants/Subcontractors and Subconsultants to enter data and report on compliance.

Prevailing Wage Certified Payroll Report Instructions

1. Prevailing Wage Certified Payroll Report applies to Contracts that include Prevailing Wage or Davis Bacon Provisions.
2. This web-based application database is provided by the City for reporting certified payrolls and other related prevailing wage data.
3. Computer Requirements: Minimum Intel Pentium® 4 Processor 2.4 GHz or equivalent processor with 512MB of RAM; recommended Centrino Duo® Processors 1.6 GHz or equivalent with 2GB of RAM, or higher.
    a. Computer Operation System: Windows XP, Windows Vista, or Windows 7
    b. Web Browser: Google Chrome
    c. Connection Speed/Minimum Bandwidth: DSL, ADSL or T1 Line for transferring a minimum of 3 Mbps Downstream and 512 Kbps Upstream
4. City will assist Contractor in providing training of personnel and Subcontractor's personnel.
5. Contractor and Subcontractors shall have the responsibility for visiting the web site and entering data in on timely basis, and as necessary to be in compliance with Prevailing Wage Requirements included in their contracts.

Workforce Monthly Report Instructions

1. Workforce Monthly Reporting only applies to Construction Contracts greater than $300,000 and greater than 800 projected labor hours.
2. The City will utilize a web-based Reporting System in the administration of this Contract. This web-based application database is a collaboration tool selected and provided by the City, which will allow Contractors and Subcontractors to enter data and report on Workforce compliance.

CITY OF KANSAS CITY, MISSOURI
Human Relations Department
M/WBE MONTHLY UTILIZATION REPORT

Report Date:	**Project Name:**		**City Project Number:**					
Project Address:			**Contract Award Date:**				**City Vendor ID:**	
General Contractor (GC):			**City Contract Number:**				**City Department Name**	
Contact Person/Phone:			**General Contract Amount:** $		**Total Amount Paid By City To Date:** $			
General Contractor Address:			**Contract Goals:**		_____% DBE _____% MBE _____% WBE			
Email Address:			**Total Contract Days:**				**Completion Date:**	
MBE/DBE Subcontractor	**Date of Certification**	**Date of Subcontract**	**Subcontract Amount**	**% of Total Contract**	**Estimated Start date**	**Amount Paid This Period**	**Amount Paid To Date**	**% of Contract Paid to Date**
WBE/DBE Subcontractor								
Totals								

Contractor should submit report by the 15th of each month.

Phillip Yelder, Director
Human Relations Department
414 E. 12th Street, 4th Floor
Kansas City, MO 64106
Phone: 816-513-1836
FAX: 816-513-1805

Narrative:

Report Submitted By: _____ **Date** _____

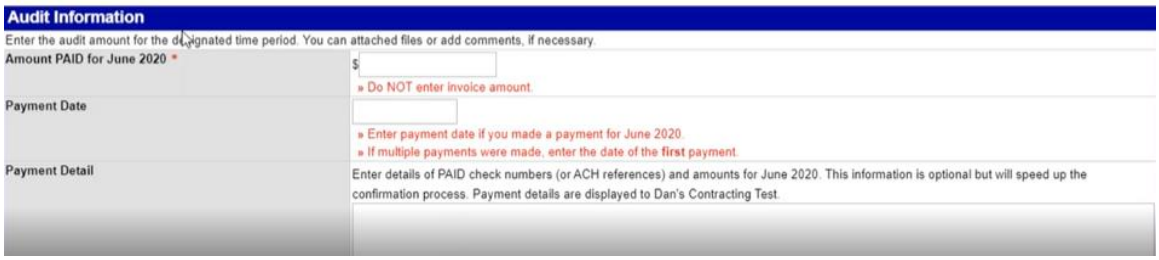
REMINDER: CONTRACTOR is responsible for meeting or exceeding the the D/M/WBE participation amounts in its Contractor Utilization Plan (CUP) as amended by any previously approved Request for Modification/Substitution. Any Change Orders or amendements modifying the amount CONTRACTOR is to be compensated will have correspondingly impacted the amount of compensation due D/M/WBEs for purposes of meeting or exceeding the Bidder/Proposer participation. CONTRACTOR is again advised to consider the effect of any Change Order or amendment, and to submit a Request for Modification/Substitution if appropriate.

M/WBE Monthly Compliance Audit Online Reporting Instructions

PRIME INSTRUCTIONS:

The Prime's responsibility is to report payments made to subcontractors for the prior month.

1. Log into B2GNow Diversity Management System (B2GNow)
2. On the Dashboard, click Contract Audits.
3. Select the specific audit that needs to be completed. Any and all money that changed hands during the month of the audit must be reported to the specific audit month.
4. To complete audit select Report 1 Subcontractor Payment. Under the actions column, select Submit Response for the specific subcontractor that needs reporting or select the Submit ALL Incomplete Records button to go to all the subcontractors to report amounts. Under the audit information answer the following questions:

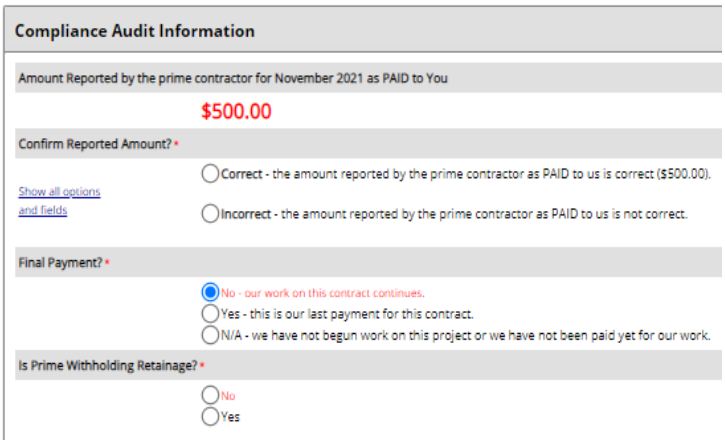


Once information has been entered, select review and save. Complete same steps for all subcontractors. If there were subcontractors that did not receive a payment for the specific audit month, click the Mark Remaining Subcontractors as Zero button to mark remaining subcontractors as 0.

SUBCONTRACTOR INSTRUCTIONS:

The responsibility of the Subcontractor is to confirm payment received for specific audit month.

1. Log in to B2GNow Diversity Management System (B2GNow)
2. On the Dashboard, select Contract Audits.
3. Select the specific audit that needs to be completed.
4. To complete audit, select Confirm Payment Received. There will be two options: correct or incorrect. Select correct if payment was in fact received OR if payment was not received or amount was different select incorrect. Answer all questions and select save to complete.



NOTE: Complete one M/WBE report per project.

An email notice will be sent from our organization monthly to notify Prime & Subcontractor users of incomplete audits.

Project Specific Monthly Report

Human Relations Department - City of Kansas City Missouri

Report Date:		Reporting Period:		Project Description:	
Project Name:		Contractor:		Contract Awarded Date:	
City Project Number:		Contractor Address:		City Contract Number:	
Project Address:				City Vendor ID:	
		Contact Person/Phone:		Contractor Report ☐	Subcontractor Report ☐
E-mail Address:				Final Cumulative Report:	☐ Yes ☐ No

Report the total monthly hours of work performed by all workers on the City Construction Contract. Enter the total hours on all lines and in all columns. Reported workforce hours should be based on payroll records.

JOB CATEGORIES	OVERALL TOTAL (Sum of all Columns, A thru F Male & Female)	A Total Hours White Employees		B Total Hours Black Employees		C Total Hours Hispanic Employees		D Total Hours Asian/Pacific Islander		E Total Hours Native American Employee		F Total Hours Other/Unknown Race Employee		G KCMO Resident Hours
		M	F	M	F	M	F	M	F	M	F	M	F	Total #
Foreman/Supervisor														
Asbestos Worker Journeyman														
Asbestos Worker Apprentice														
Boilermaker Journeyman														
Boilermaker Apprentice														
Bricklayer Journeyman														
Bricklayer Apprentice														
Carpenter Journeyman														
Carpenter Apprentice														
Cement Mason Journeyman														
Cement Mason Apprentice														
Electrician Journeyman														
Electrician Apprentice														
Elevator Constructor Journeyman														
Elevator Constructor Apprentice														
Glazier Journeyman														
Glazier Apprentice														
Iron Worker Journeyman														
Iron Worker Apprentice														
Laborer Journeyman														
Laborer Apprentice														
Operating Engineer Journeyman														
Operating Engineer Apprentice														
Painter Journeyman														
Painter Apprentice														
Pipe Fitter/Plumber Journeyman														
Pipe Fitter/Plumber Apprentice														
Plasterer Journeyman														
Plasterer Apprentice														
Roofer Journeyman														
Roofer Apprentice														
Sheet Metal Journeyman														
Sheet Metal Apprentice														
Sprinkler Fitter														
Sprinkler Fitter Apprentice														
Truck Driver Journeyman														
Truck Driver Apprentice														
Welder Journeyman														
Welder Apprentice														
Other														
Monthly Total Hours														-
Total % of Monthly Hrs.														

Contractor shall submit report by the 15th of each month.

Phillip Yelder, Director Human Relations Department
414 E. 12th Street, 4th Floor Kansas City, MO 64106
Phone: 816-513-1836 Email HRDcontractcompliance@kcmo.org

Report Submitted By: _____

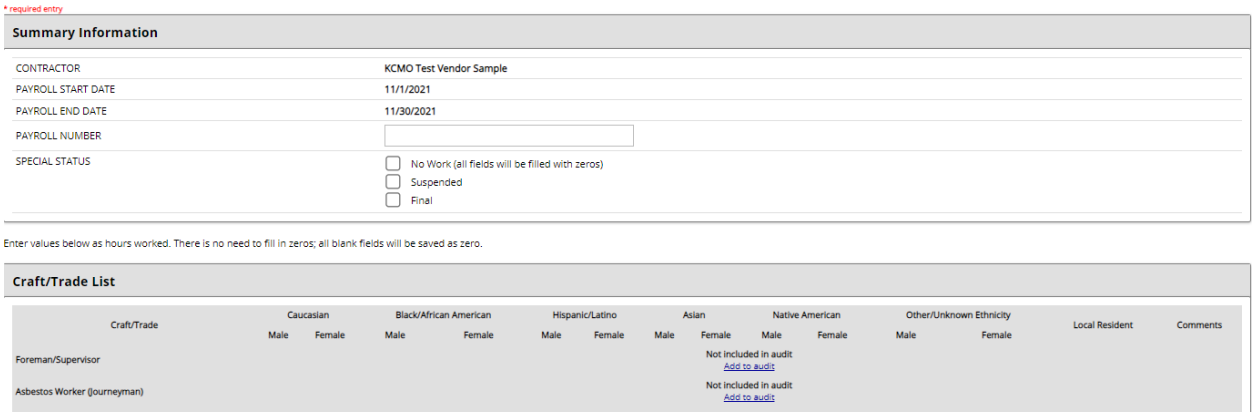
Date: _____

Workforce Monthly Report Forms only apply to Construction Contracts greater than $300,000.00 with greater than 800 projected labor hours.

Workforce Monthly Report Instructions

(Instructions for online reporting)

Completing a Workforce Audit:
To report your workforce hours:
1. Log into B2GNow Diversity Management System (B2GNow)
2. Click on the red underlined number of 'Incomplete audits' under Workforce Audits
3. Click View for the incomplete audit that needs to be completed.
4. Click Fill in Audit
5. Complete the form including the Payroll Number. Select Add to Audit to report hours worked for specific Craft/Trade.


* required entry

Summary Information

CONTRACTOR	KCMO Test Vendor Sample
PAYROLL START DATE	11/1/2021
PAYROLL END DATE	11/30/2021
PAYROLL NUMBER	
SPECIAL STATUS	☐ No Work (all fields will be filled with zeros) ☐ Suspended ☐ Final

Enter values below as hours worked. There is no need to fill in zeros; all blank fields will be saved as zero.

Craft/Trade List

Craft/Trade	Caucasian		Black/African American		Hispanic/Latino		Asian		Native American		Other/Unknown Ethnicity		Local Resident	Comments
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female		
Foreman/Supervisor								Not included in audit Add to audit						
Asbestos Worker (Journeyman)								Not included in audit Add to audit						

6. Scroll down and select review once hours have been reported.
7. Save and Certify to submit OR Save but Certify Later (to save a draft of your audit response). Audit must be certified for the workforce audit to be submitted for review. If there is an audit where no work was performed, and have 0 hours to report, select the Mark as No Work Audit button on step 4 to report 0 hours for all your employees. Select Certify & Release to Organization to complete. Mark Final for Special Status if the audit being completed is the last month of work, this will notify the system to stop generating monthly audits.

NOTE: If subcontractor has completed Workforce Audit, Prime MUST either accept audit and release to the organization or reject audit back to Subcontractor for correction.

An email notice will be sent from our organization monthly to notify Prime & Subcontractor users of incomplete audits.

Company-Wide Workforce Monthly Report

Human Relations Department - City of Kansas City, Missouri

Report Date:		Reporting Period:		Contract Awarded Date:	
Contractor:				City Vendor ID:	
Contact Person/Phone:		Contractor Address:		Contractor Report ☐	Subcontractor Report ☐
E-mail Address:		Have you hired any new construction workers this month?	☐ Yes ☐ No #:	Final Cumulative Report:	☐ Yes ☐ No

Report total of all hours of work performed company-wide on all projects in the KCMO Metropolitan Statistical Area (MSA). Enter the total hours on all lines and in all columns. Workforce hours should be based on payroll records.

JOB CATEGORIES	OVERALL TOTAL (Sum of all Columns, A thru F Male & Female)	A Total Hours White Employees		B Total Hours Black Employees		C Total Hours Hispanic Employees		D Total Hours Asian/Pacific Islander		E Total Hours Native American Employee		F Total Hours Other/Unknown Race Employee		G KCMO Resident Hours
		M	F	M	F	M	F	M	F	M	F	M	F	Total #
Foreman/Supervisor														
Asbestos Worker Journeyman														
Asbestos Worker Apprentice														
Boilermaker Journeyman														
Boilermaker Apprentice														
Bricklayer Journeyman														
Bricklayer Apprentice														
Carpenter Journeyman														
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Cement Mason Journeyman														
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Elevator Constructor Journeyman														
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Iron Worker Apprentice														
Laborer Journeyman														
Laborer Apprentice														
Operating Engineer Journeyman														
Operating Engineer Apprentice														
Painter Journeyman														
Painter Apprentice														
Pipe Fitter/Plumber Journeyman														
Pipe Fitter/Plumber Apprentice														
Plasterer Journeyman														
Plasterer Apprentice														
Roofer Journeyman														
Roofer Apprentice														
Sheet Metal Journeyman														
Sheet Metal Apprentice														
Sprinkler Fitter														
Sprinkler Fitter Apprentice														
Truck Driver Journeyman														
Truck Driver Apprentice														
Welder Journeyman														
Welder Apprentice														
Other														
Total Monthly Hours														-
Total % of Hours														

Contractor shall submit report by the 15th of each month.

Phillip Yelder, Director Human Relations Department
414 E. 12th Street, 4th Floor, Kansas City, MO 64106
Phone: 816-513-1836 Email HRDcontractcompliance@kcmo.org

Report Submitted By: _____

Date: _____

City of Kansas City, Missouri
Civil Rights & Equal Opportunity Department
Construction Contractor Employee Identification Report

Company Name: _____ **Prime's Name:** _____

Company Address: _____ **KCMO Project Name:** _____

Company City, State, Zip: _____ **KCMO Project Number:** _____

Name of Person Completing Report: _____ **Today's Date:** _____

Phone Number: _____

Email: _____ **City Department:** _____

Instructions:

1) Each applicable Prime Contractors **must complete this form for its company within 48 hours of bid opening**
2) The Civil Rights & Equal Opportunity Department strongly recommends usage of the electronic version of this form. This form may be obtained by visiting www.kcmo.gov website. The website is enabled with a "search" function on the Home page on the right corner. Select the magnifying glass and type in the search field "Contract Central". Select the first result, then click on the link to Standard City Contract Forms. Scroll down to Construction Contractor Employee Identification Report and click the link to open this document. Complete the fields in the Employee section; the Official Use Only section will automatically populate. NOTE: This form can be printed and attached to other required Bid documents.
3) All subcontractors shall be required to complete this form and submit to the Prime Contractor. For each subcontractor, the Prime must submit this form to City at least at least (10) days prior to the date the subcontractor shall commence work under a city construction contract.
4) Complete this form if you are the Prime contractor on a City construction project estimated over **$300,000 & over 800 man hours.**
5) Complete this form with data from your **current construction workforce** (no office personnel).
6) Prime contractor is responsible to ensure subcontractor completes this form as required in #3 above.

Official Use Only

Females		*KCMO Resident*
African American	*0*	*0*
Asian/Pacific Islander American	*0*	*0*
Caucasian American	*0*	*0*
Hispanic/Latino American	*0*	*0*
Native American	*0*	*0*
Other	*0*	*0*
	0	*0*

Males		*KCMO Resident*
African American	######	*0*
Asian/Pacific Islander American	######	*0*
Caucasian American	######	*0*
Hispanic/Latino American	######	*0*
Native American	######	*0*
Other	######	*0*
	######	*0*

Number of KCMO Residents	*0*
Number of Journeyman	*0*
Number of Apprentice	*0*

	Journeyman	*Apprentice*
Foreman/Supervisor	*0*	*--*
Asbestos Worker	*0*	*0*
Boilermaker	*0*	*0*
Bricklayer	*0*	*0*
Carpenter	*0*	*0*
Cement Mason	*0*	*0*
Electrician	*0*	*0*
Elevator Constructor	*0*	*0*
Glazier	*0*	*0*
Iron Worker	*0*	*0*
Laborer	*0*	*0*
	0	0

	Journeyman	*Apprentice*
Operating Engineer	*0*	*0*
Painter	*0*	*0*
Pipe Fitter/Plumber	*0*	*0*
Plasterer	*0*	*0*
Roofer	*0*	*0*
Sheet Metal	*0*	*0*
Sprinkler Fitter	*0*	*0*
Truck Driver	*0*	*0*
Welder	*0*	*0*
Other	*0*	*--*
	0	*0*

Company Name: 0 KCMO Project Name: 0 KCMO Project Number: 0

	Name		Job Title (*use drop down menu*)	Address	City	State	Zip Code	KCMO Resident	Gender	Ethnicity
	Last	First								
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Company Name: 0 KCMO Project Name: 0 KCMO Project Number: 0

	Name		Job Title (*use drop down menu*)	Address	City	State	Zip Code	KCMO Resident	Gender	Ethnicity
	Last	First								
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17										
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Company Name: 0 KCMO Project Name: 0 KCMO Project Number: 0

	Name		Job Title (*use drop down menu*)	Address	City	State	Zip Code	KCMO Resident	Gender	Ethnicity
	Last	First								
50										
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AFFIDAVIT OF TRAINING PROGRAM

This form must be submitted with 48 hours of Bid Opening

Bidder _____

Project Title and Number _____

STATE OF MISSOURI)
) ss:
COUNTY OF _____)

After being duly sworn the person whose name and signature appears below hereby states under penalty of perjury that:

1. I am the duly authorized officer of the business indicated above ("Bidder") and I make this affidavit on behalf of Bidder.
2. Bidder certifies that it presently participates in a training program that facilitates entry into the construction industry and which may include an on-the-job or in-house training program, further described as follows:

(attach additional pages, if necessary)

3. If requested by the City, Bidder agrees to provide City further documentation of, or other information about, this training program within 48 hours of the request.
4. Bidder acknowledges that failure to submit this form to the City within 48 hours of the Bid Opening will automatically render its bid non-responsive.

I am authorized to make this Affidavit on behalf of the Bidder named below as:

_____ of _____
(Title) (Name of Bidder)

Dated: _____ By: _____
(Affiant)

Subscribed and sworn to before me this _____ day of _____, 20____.

My Commission Expires: _____ _____
Notary Public

AFFIRMATIVE ACTION PROGRAM AFFIDAVIT

(required for any contractor with 50 or more employees and
a contract with the City of Kansas City, Missouri, in excess of $300,000.00)

STATE OF _____)
) ss
COUNTY OF _____)

On this _____ day of _____, 20___, before me appeared _____, personally known by me or otherwise proven to be the person whose name is subscribed on this affidavit and who, being duly sworn, stated as follows:

I am of sound mind, capable of making this affidavit, and personally swear or affirm that the statements made herein are truthful to the best of my knowledge. I am the _____ (title) of _____ (business entity) and I am duly authorized, directed or empowered to act with full authority on behalf of the business entity in making this affidavit.

I hereby swear or affirm that [*enter business entity name*] has an affirmative action program (the "Program") in place and will maintain the Program for the duration of its contract with the City of Kansas City, Missouri ("City") as required by Chapter 3 of the City's Code of Ordinances.

I hereby additionally swear or affirm that attached hereto is a true copy of the Program.

I hereby additionally swear or affirm that the business entity shall not discriminate against any employee or applicant for employment because of race, color, sex, religion, national origin or ancestry, disability, sexual orientation, gender identity or age in a manner prohibited by Chapter 3 of the City's Code of Ordinances.

I acknowledge that I am signing this affidavit as the free act and deed of the business entity and that I am not doing so under duress.

_____
Affiant's signature

Subscribed and sworn to before me this _____ day of _____, 20____.

_____
Notary Public

My Commission expires:

Civil Rights and Equal Opportunity Department
Civil Rights and Wage Assurances

Non-discrimination in Employment. Contractor shall not discriminate against any employee or candidate for employment on the basis of an individual's race, hair texture or hair style associated with an individual's race, color, sex, religion, national origin, or ancestry, disability, sexual orientation, gender identity, age, or in any other manner prohibited by Chapter 38 of the City Code. Contractor shall not engage in any discrimination as prohibited by Chapter 3 of the City Code.

Ban the Box in Hiring and Promotion.

(a) Pursuant to Section 38-104, City Code Ordinances, Contractor shall not base a hiring or promotional decision on an applicant's criminal history or sentence related thereto, unless the employer can demonstrate that the employment-related decision was based on all information available including consideration of the frequency, recentness and severity of a criminal record and that the record was reasonably related to the duties and responsibilities of the position.

(b) Notwithstanding subsection (a), Contractor may inquire about an applicant's criminal history after it has been determined that the individual is otherwise qualified for the position, and only after the applicant has been interviewed for the position. Any such inquiry may be made of all applicants who are within the final selection pool of candidates from which a job will be filled.

(c) This provision shall not apply to positions where employers are required to exclude applicants with certain criminal convictions from employment due to local, state or federal law or regulation.

Title VI of the Civil Rights Act of 1964. Title VI of the Civil Rights Act of 1964 requires that no person in the United States shall, on the grounds of race, color, or national or origin (including limited English proficient individuals), be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving federal financial assistance. The City of Kansas City, Missouri requires compliance with the requirements of Title VI in all of its programs and activities regardless of the funding source.
Contractor shall not discriminate on the grounds of race, color, or national or origin (including limited English proficient individuals).

Quality Services Assurance Act. If this Contract exceeds $160,000.00, Contractor certifies Contractor will pay all employees who will work on this Contract in the city limits of Kansas City, Missouri at least $15.00 per hour in compliance with the City's Quality Services Assurance Act,

Section 3-66, Code of Ordinances or City has granted Contractor an exemption pursuant to the Quality Services Assurance Act.

Anti-Discrimination Against Israel. If this Contract exceeds $100,000.00 and Contractor employs at least ten employees, pursuant to Section 34.600, RSMo., by executing this Contract, Contractor certifies it is not currently engaged in and shall not, for the duration of this contract, engage in a boycott of goods or services from the State of Israel; companies doing business in or with Israel or authorized by, licensed by, or organized under the laws of the State of Israel; or persons or entities doing business in the State of Israel.

Affirmative Action. If this Contract exceeds $300,000.00 and Contractor employs fifty (50) or more people, Contractor shall comply with City's Affirmative Action requirements in accordance with the provisions of Chapter 38 of City's Code, the rules and regulations relating to those sections, and any additions or amendments thereto; in executing any Contract subject to said provisions, Contractor warrants that it has an affirmative action program in place and will maintain the affirmative action program in place for the duration of the Contract. Contractor shall not discriminate against any employee or applicant for employment because of race, color, sex, religion, national origin or ancestry, disability, sexual orientation, gender identity or age in a manner prohibited by Chapter 38 of City's Code. Contractor shall:

(a) Execute and submit the City of Kansas City, Missouri CREO Affirmative Action Program Affidavit warranting that the Contractor has an affirmative action program in place and will maintain the affirmative action program in place for the duration of the Contract.

(b) Submit, in print or electronic format, a copy of Contractor's current certificate of compliance to the City's Civil Rights and Equal Opportunity Department (CREO) prior to receiving the first payment under the Contract, unless a copy has already been submitted to CREO at any point within the previous two (2) calendar years. If, and only if, Contractor does not possess a current certification of compliance, Contractor shall submit, in print or electronic format, a copy of its affirmative action program to CREO prior to receiving the first payment under the Contract, unless a copy has already been submitted to CREO at any point within the previous two (2) calendar years.

(c) Require any Subcontractor awarded a subcontract exceeding $300,000.00 to affirm that Subcontractor has an affirmative action program in place and will maintain the affirmative action program in place for the duration of the subcontract.

(d) Obtain from any Subcontractor awarded a subcontract exceeding $300,000.00 a copy of the Subcontractor's current certificate of compliance and tender a copy of the same, in print or electronic format, to CREO within thirty (30) days from the date the subcontract is executed. If, and only if, Subcontractor does not possess a current certificate of compliance, Contractor shall obtain a copy of the Subcontractor's affirmative action program and tender a copy of the same, in print or electronic format, to CREO within thirty (30) days from the date the subcontract is executed.

City has the right to take action as directed by City's Civil Rights and Equal Opportunity Department to enforce this provision. If Contractor fails, refuses or neglects to comply with the provisions of Chapter 38 of City's Code, then such failure shall be deemed a total breach of this Contract and this Contract may be terminated, cancelled or suspended, in whole or in part, and Contractor may be declared ineligible for any further contracts funded by City for a period of one (1) year. This is a material term of this Contract.

Compliance with Laws. Contractor shall comply with all federal, state and local laws, ordinances and regulations applicable to the work and this Agreement. Contractor shall maintain in effect all the licenses, permissions, authorizations, consents and permits that it needs to carry out its obligations under this Agreement.

Prevailing Wage. If the Agreement exceeds $75,000.00 and any of the Services performed by Contractor includes construction, reconstruction, improvement, enlargement, alteration, painting and decorating, or major repair, that is subject to the Missouri Prevailing Wage Law (Section 290.210, RSMo – 290.340, RSMo), Contractor shall immediately notify the City prior to performing Services so the parties can execute an agreement that incorporates, the appropriate Wage Order. Contractor shall comply with all requirements of Section 290.210, RSMo – 290.340, RSMo even if Contractor fails to notify
the City.

AFFIDAVIT OF INTENDED UTILIZATION

(This Form must be submitted with your Bid/Proposal)

_____
(Department Project)

_____
(Bidder/Proposer)

STATE OF _____)
) ss
COUNTY OF _____)

I, _____, of lawful age and upon my oath state as follows:

1. This Affidavit is made for the purpose of complying with the provisions of the Civil Rights & Equal Opportunity Department's submittal requirements in the bid/proposal specifications on the above project and is given on behalf of the Bidder/Proposer listed below.

2. Bidder/Proposer assures that it presently intends to utilize the following MBE/WBE participation in the above project if awarded the Contract:

PROJECT GOALS: _____% MBE _____% WBE

BIDDER/PROPOSER PARTICIPATION: _____% MBE _____% WBE

3. To the best of Bidder's/Proposer's knowledge, the following are the names of certified MBEs or WBEs with whom Bidder/Proposer, or Bidder's/Proposer's subcontractors, presently intend to contract if awarded the Contract on the above project: ***(All firms must <u>currently</u> be certified by Kansas City, Missouri Dept. Of Civil Rights & Equal Opportunity)***

a. Name of M/WBE Firm _____
Address _____
Telephone No. _____
I.R.S. No. _____
Area/Scope of work _____
Subcontract amount _____

b. Name of M/WBE Firm _____
Address _____
Telephone No. _____
I.R.S. No. _____
Area/Scope of work _____
Subcontract amount _____

c. Name of M/WBE Firm _____
Address _____
Telephone No. _____
I.R.S. No. _____
Area/Scope of work _____
Subcontract amount _____

(List additional MBE/WBEs, if any, on additional pages and attach to this form)

4. Bidder/Proposer will identify before contract award, those MBE/WBE subcontractors with dollar amounts and scopes of work which apply to or exceed the MBE/WBE goals for the Project on the ***Contractor Utilization Plan/Request for Waiver (CREO KC 08)***.

5. Bidder/Proposer agrees that failure to meet or exceed the MBE/WBE Goals for the above project will automatically render this bid/proposal non-responsive if Bidder/Proposer fails to establish good faith efforts towards meeting the goals as set forth in the CREO KC Forms and Instructions.

6. If applicable, Bidder/Proposer assures that it will meet or exceed the minimum employment goals of 10% minority and 2% women during the term of its contract with City, or request a waiver of the goals. **NOTE**: **This paragraph is applicable ONLY if you are submitting a bid/proposal on a construction contract that was estimated by the City, prior to solicitation, as requiring more than 800 construction labor hours and costing in excess of $300,000.00.**

7. I am authorized to make this Affidavit on behalf of the Bidder/Proposer named below as:

_____ of _____
(Title) (Name of Bidder/Proposer)

Dated: _____ By: _____
(Affiant)

Subscribed and sworn to before me this _____ day of _____, 20____.

My Commission Expires: _____ _____
Notary Public

CITY OF FOUNTAINS
HEART OF THE NATION

KANSAS CITY
MISSOURI

CREO KC Contract Close-Out Approval

Date: _____

To: _____, Civil Rights & Equal Opportunity Department

From: _____, _____ Department

Subject: Contract/Project No.: _____

Project Title: _____

Type:	☐ Original	☐ Amendment No. _____ (See Contract Summary on the next page.)		■
Funding:	☐ City (MBE/WBE/DBE)	☐ Federal (DBE)[1]	☐ State (DBE)[1] - Grant _____	
	☐ Other:			
Contract Category:	☐ Construction[2]	☐ General Service	☐ Facility Repair	
	☐ Design Professional[3]	☐ Professional Services	☐ Concession	☐ Other:
Company:		NOTE: Attach:		

☐ M/WBE Participation - Documentation Attached [*Not required for DBE or MBE/WBE Participation under a Granting Agency Program. i.e. MoDOT, DNR, FAA, EPA, etc*.]

- Copy of Invoice or Construction Payment Application Packet
- Copy of the most recent 00485.01 or on-line M/WBE Monthly Utilization Report Contractor has submitted
- Contractor's Affidavit of Final Payment
- Subcontractors' Affidavits for Final Payment

☐ Prevailing Wage

☐ Workforce Program

cc: Project Manager

FOR CIVIL RIGHTS & EQUAL OPPORTUNITY DEPARTMENT USE ONLY

D/M/WBE Participation

☐ Applicable – No LD's ☐ Applicable – LD's assessed $_____ ☐ Not Applicable

_____ _____

Civil Rights & Equal Opportunity Department Date

Prevailing Wage

☐ Applicable – No LD's/penalties ☐ Applicable – LD's/penalties assessed $_____ ☐ Not Applicable

_____ _____

Civil Rights & Equal Opportunity Department Date

Workforce Program

☐ Applicable – No LD's ☐ Applicable – LD's assessed $_____ ☐ Not Applicable

_____ _____

Civil Rights & Equal Opportunity Department Date

[1] DBE Programs apply to specific federal or state grant requirements.

[2] Construction – Only Contracts Executed after 1/1/2008

[3] Non-Construction – Only Contracts Executed after 7/8/09

CITY OF FOUNTAINS
HEART OF THE NATION

KANSAS CITY
MISSOURI

Pre Contract Bidder's Certification

Project/Contract Numbers 80002543/9911

Project Title Vertical Wells 2-5 Replacement

STATE OF)
) SS
COUNTY OF)

Before me, the undersigned authority, personally appeared, who, being by me duly sworn deposed as follows:

I am authorized to make this affidavit on behalf of the named Bidder. I am of sound mind, capable of making this affidavit, and personally acquainted with the facts herein stated:

A. Bidder is current on payment of its Federal and State Income tax withholding and unemployment insurance payments, either in Missouri for companies doing business in Missouri, or in the state in which Bidder has its principal office; and

B. Bidder declares one of the following, regarding all work performed two (2) years immediately preceding the date of the Bid (check one):

☐ Contract by contract listing of all of Bidder's written notices of violations of any Federal or State prevailing wage statute in which prevailing wage penalties were assessed against the Bidder or paid by the Bidder (Complete and attach additional sheets if necessary):

1. _____
2. _____
3. _____

☐ There have been no written notices of violations of any Federal or State prevailing wage statute in which prevailing wage penalties were assessed against the Bidder or paid by the Bidder.

C. Bidder is currently in good standing with the Missouri Secretary of State or Bidder has filed a Registration of Fictitious Name with the Missouri Secretary of State.

_____
(Bidder's Name) (Date)

Signature of Person Making This Affidavit

In witness whereof, I have hereunto subscribed my name and affixed my official seal this ___day of , 20__.

CITY OF FOUNTAINS
HEART OF THE NATION

KANSAS CITY
MISSOURI

CONTRACT REQUIRED SUBMISSIONS

Project/Contract Numbers 80002543/9911

Project Title Vertical Wells 2-5 Replacement

These instructions are to assist Contractor in providing all necessary documents to enter into a contract with the City.

MISSOURI SECRETARY OF STATE BUSINESS ENTITY REGISTRATION

- ☐ For a corporation, current Certificate of Good Standing from the Missouri Secretary of State ((816) 889-2925 or (816) 889-2926 or a web site print-out, dated no more than ninety (90) days before the date furnished to the City – One Copy.
- ☐ For a business that is not a corporation and not doing business in the exact name of the proprietor, a copy from the Secretary of State, ((816) 889-2925 or (816) 889-2926 of the filed Registration of Fictitious Name dated no more than ninety (90) days before the date furnished to the City – One Copy.

EMPLOYEE ELIGIBILITY VERIFICATION AFFIDAVIT [Required if the contract exceeds $5,000.00]

- ☐ 00515.01 Employee Eligibility Verification Affidavit – One Executed Affidavit
- ☐ First and last pages of the E-Verify Program Memorandum of Understanding that your company has received from the U.S. Department of Homeland Security verifying enrollment in the program. For assistance, contact E-Verify Operations at 888-464-4218 – One Copy.

SUBCONTRACTORS LISTING [Applicable form provided]

- ☐ Non-Construction Subcontractors List – One Copy
- ☐ 01290.09 Subcontractors & Major Material Suppliers List – One Copy

PAYMENT BONDS (If applicable)

- ☐ Each copy of the Payment bond must be signed and properly dated by the following, as applicable:

  Corporation - A corporate officer authorized to sign on behalf of the corporation and the signature must be attested by a witness to the signature; OR

  Limited Liability Company - A member of the limited liability company authorized to sign on behalf of the company and a witness to the signature must attest the signature; OR

  Partnership - A partner authorized to sign on behalf of the partnership and the signature must be attested by a witness to the signature; OR

  Sole Proprietor - By the proprietor and the signature must be attested by a witness to the signature; OR

  Joint Venture - The parties to the Joint Venture authorized to sign on behalf of each party to the Joint Venture, or a person authorized by each party to the Joint Venture to sign on behalf of all parties to the Joint Venture; AND

  Surety - A person authorized by the Surety to sign on behalf of the Surety. A power of attorney issued by the Surety Company authorizing its representative to sign the Agreement must be attached to the Agreement and each copy.

PERFORMANCE AND MAINTENANCE BOND (If applicable)

- ☐ As applicable, each copy of the Performance and Maintenance bond must be signed and properly dated by:

  Corporation - A corporate officer authorized to sign on behalf of the corporation and the signature must be attested by a witness to the signature; OR

  Limited Liability Company - A member of the limited liability company authorized to sign on behalf of the company and a witness to the signature must attest the signature; OR

  Partnership - A partner authorized to sign on behalf of the partnership and the signature must be attested by a witness to the signature; OR

  Sole Proprietor - By the proprietor and the signature must be attested by a witness to the signature; OR

  Joint Venture - The parties to the Joint Venture authorized to sign on behalf of each party to the Joint Venture, or a person authorized by each party to the Joint Venture to sign on behalf of all parties to the Joint Venture; AND

  Surety - A person authorized by the Surety to sign on behalf of the Surety. A power of attorney issued by the Surety Company authorizing its representative to sign the Agreement must be attached to the Agreement and each copy.

CERTIFICATES OF INSURANCE [Sample form provided] - If you have any questions regarding requirements for insurance certificates, please contact the City's Risk Management Office, 816 513-1299.

- ☐ Provide a certificate of insurance for all insurance that may be required in the contract such as:

  Commercial General Liability
  Workers' Compensation and Employers' Liability
  Commercial Automobile Liability
  Railroad Protective Liability
  Environmental Liability
  Asbestos Liability
  Longshoremen's Insurance
  Property Insurance

- ☐ List the NAIC Number (National Association of Insurance Commissioners) or A.M. Best Number for each Insurer listed on the Certificate of Insurance.

- ☐ Certificate "Kansas City, Missouri" must named as an Additional Insured.

- ☐ Check the insurance requirements of the Contract. If Contract Documents require that other entities be included as additional insureds, each entity shall be listed on the certificate(s).

- ☐ Description of Operations must include Project/Contract Number and Project/Contract Title/Description as contained in the Contract Documents. The Certificate Holder and address block shall be completed as follows:

  Kansas City, Missouri
  [Water Services Department]
  [Name of Contract Administrator, Buyer, or Project Manager]
  [Department Address]
  Kansas City, Missouri [Zip Code]

- ☐ If your insurance agent prepares an ACORD form, the automobile insurance must be "any auto" or better for acceptance by the City.

AFFIRMATIVE ACTION REQUIREMENTS

- ☐ Proposed Affirmative Action Program or a copy of a Certificate of Affirmative Action Compliance – One copy.

PRE-CONTRACT BIDDER'S CERTIFICATION (Prevailing Wage Contracts; Form provided)

- ☐ Submit form 00490 - Bidder's Pre-Contract Certification (provided).

HEALTH AND SAFETY PLAN (If applicable)

- ☐ Bidder's Health and Safety Plan – One copy or one CD Rom.

EMPLOYEE ELIGIBILITY VERIFICATION AFFIDAVIT

(Required for any contract with the City of Kansas City, Missouri in excess of $5,000.00)

STATE OF _____)
) ss
COUNTY OF _____)

On this _____ day of _____, 20___, before me appeared _____, personally known by me or otherwise proven to be the person whose name is subscribed on this affidavit and who, being duly sworn, stated as follows:

I am of sound mind, capable of making this affidavit, and personally swear or affirm that the statements made herein are truthful to the best of my knowledge. I am the _____ (title) of _____ (business entity) and I am duly authorized, directed or empowered to act with full authority on behalf of the business entity in making this affidavit.

I hereby swear or affirm that the business entity does not knowingly employ any person in connection with the contracted services who does not have the legal right or authorization under federal law to work in the United States as defined in 8 U.S.C. § 1324a(h)(3).

I hereby additionally swear or affirm that the business entity is enrolled in an electronic verification of work program operated by the United States Department of Homeland Security (E-Verify) or an equivalent federal work authorization program operated by the United States Department of Homeland Security to verify information of newly hired employees, under the Immigration Reform and Control Act of 1986, and that the business entity will participate in said program with respect to any person hired by the business entity to perform any work in connection with the contracted services. I have attached hereto documentation sufficient to establish the business entity's enrollment and participation in the required electronic verification of work program.

I am aware and recognize that unless certain contractual requirements are satisfied and affidavits obtained as provided in Section 285.530, RSMo, the business entity may face liability for violations committed by its subcontractors, notwithstanding the fact that the business entity may itself be compliant.

I acknowledge that I am signing this affidavit as the free act and deed of the business entity and that I am not doing so under duress.

_____
Affiant's signature

Subscribed and sworn to before me this _____ day of _____, 20____.

_____
Notary Public

My Commission expires:

Reset Form Print Form

Form **5060**

Missouri Department of Revenue
Project Exemption Certificate

This form is to be completed and given to your contractor.

Exempt Entity and Project Information

Name of Exempt Entity Issuing the Certificate			Missouri Tax Exemption Number
Address	City	State	ZIP Code
E-mail Address			
Project Number	Project Begin Date (MM/DD/YYYY)		Estimated Project End Date (MM/DD/YYYY)
	___ ___ / ___ ___ / ___ ___ ___ ___		___ ___ / ___ ___ / ___ ___ ___ ___
Description of Project			
Project Location			Certificate Expiration Date (MM/DD/YYYY)
			___ ___ / ___ ___ / ___ ___ ___ ___

Provide a signed copy of this certificate, along with a copy of the exempt entity's Missouri Sales and Use Tax Exemption Letter to each contractor or subcontractor who will be purchasing tangible personal property for use in this project. It is the responsibility of the exempt entity to ensure the validity of the information on the certificate. The exempt entity must issue a new certificate if any of the information changes.

Signature of Authorized Exempt Entity	Printed Name of Authorized Exempt Entity	Date (MM/DD/YYYY)
		___ ___ / ___ ___ / ___ ___ ___ ___

Contractor

The Missouri exempt entity named above hereby authorizes the purchase, without sales tax, of tangible personal property to be incorporated or consumed in the construction project identified herein and no other, pursuant to **Section 144.062, RSMo.** Under penalties of perjury, I declare that the above information and any attached supplement is true, complete, and correct.

Name of Purchasing Contractor	Signature of Contractor	Date (MM/DD/YYYY)
		___ ___ / ___ ___ / ___ ___ ___ ___

Address	City	State	ZIP Code

Subcontractor

Contractors - Present this to your supplier in order to purchase the necessary materials tax exempt. Complete the Subcontractor portion if extending the certificate to your subcontractor. The contractor must sign the form in the space provided below.

Name of Purchasing Subcontractor			
Address	City	State	ZIP Code

Signature of Contractor	Contractor's Printed Name	Date (MM/DD/YYYY)
		___ ___ / ___ ___ / ___ ___ ___ ___

Taxation Division
P.O Box 358
Jefferson City, MO 65105-0358

Phone: (573) 751-2836
Fax: (573) 522-1271
E-mail: salestaxexemptions@dor.mo.gov

Visit **http://dor.mo.gov/business/sales/sales-use-exemptions.php** for additional information.

State of Missouri

EXEMPTION FROM MISSOURI SALES AND USE TAX ON PURCHASES

Issued to:

CITY OF KANSAS CITY
414 E 12TH ST 3RD FLOOR
KANSAS CITY MO 64106

Missouri Tax ID Number: 12490466

Effective Date: 07/11/2002

Your application for sales/use tax exempt status has been approved pursuant to Section 144.030.1, RSMo. This letter is issued as documentation of your exempt status.

Purchases by your Agency are not subject to sales or use tax if within the conduct of your Agency's exempt functions and activities. When purchasing with this exemption, furnish all sellers or vendors a copy of this letter. This exemption may not be used by individuals making personal purchases.

A contractor may purchase and pay for construction materials exempt from sales tax when fulfilling a contract with your Agency only if your Agency issues a project exemption certificate and the contractor makes purchases in compliance with the provisions of Section 144.062, RSMo.

Sales by your Agency are subject to all applicable state and local sales taxes. If you engage in the business of selling tangible personal property or taxable services at retail, you must obtain a Missouri Retail Sales Tax License and collect and remit sales tax.

This is a continuing exemption subject to legislative changes and review by the Director of Revenue. If your Agency ceases to qualify as an exempt entity, this exemption will cease to be valid. This exemption is not assignable or transferable. It is an exemption from sales and use taxes only and is not an exemption from real or personal property tax.

Any alteration to this exemption letter renders it invalid.

If you have any questions regarding the use of this letter, please contact the Division of Taxation and Collection, P.O. Box 3300, Jefferson City, MO 65105-3300, phone 573-751-2836.

(DI6030)

CITY OF FOUNTAINS
HEART OF THE NATION

KANSAS CITY
MISSOURI

PERFORMANCE AND MAINTENANCE BOND

Project/Contract Numbers 80002543/9911_____

Project Title Vertical Wells 2-5 Replacement_____

KNOW ALL MEN BY THESE PRESENTS: That _____, as PRINCIPAL (CONTRACTOR), and _____, (SURETY), licensed to do business as such in the State of Missouri, hereby bind themselves and their respective heirs, executors, administrators, successors, and assigns unto Kansas City, Missouri, a constitutionally chartered municipal corporation, (OWNER), as obligee, in the penal sum of _____ Dollars ($ _____) for the payment whereof CONTRACTOR and SURETY bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS,

CONTRACTOR has entered into a Contract with OWNER for **(80002543/9911 Vertical Wells 2-5 Replacement)**, which Contract, including any present or future amendment thereto, is incorporated herein by reference and is hereinafter referred to as the Contract.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that, if CONTRACTOR shall promptly and faithfully perform said Contract including all duly authorized changes thereto, and including any maintenance requirements contained therein, according to all the terms thereof, including those under which CONTRACTOR agrees to pay legally required wage rates including the prevailing hourly rate of wages in the locality, as determined by the Department of Labor and Industrial Relations or by final judicial determination, for each craft or type of workman required to execute the Contract and, further, shall defend, indemnify, and hold harmless OWNER from all damages, including but not limited to, liquidated damages, loss and expense occasioned by any failure whatsoever of said CONTRACTOR and SURETY to fully comply with and carry out each and every requirement of the Contract, then this obligation shall be void; otherwise, it shall remain in full force and effect.

WAIVER. That SURETY, for value received, hereby expressly agrees that no change, extension of time, alteration or addition to the terms of the Contract or to the Work to be performed thereunder, shall in any way affect the obligations of this Bond; and it does hereby waive notice of any such change, extension of time, or alteration or addition to the terms of the Contract or the Work to be performed thereunder.

IN WITNESS WHEREOF, the above parties have executed this instrument the ____ day of _____, 20__.

CONTRACTOR
Name, address and facsimile number of Contractor

_____
_____
_____
_____

I hereby certify that I have authority to execute
this document on behalf of Contractor.

By: _____
Title:_____

(Attach corporate seal if applicable)

SURETY
Name, address and facsimile number of Surety:

_____
_____
_____
_____

I hereby certify that (1) I have authority to execute this document on behalf of Surety; (2) Surety has an A.M. Best rating of A-, V, or better; (3) Surety is named in the current list of "Companies Holding Certificates of Authority as Acceptable Reinsuring Companies: as published in Circular 570 (most current revision) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury; and (4) Surety is duly licensed to issue bonds in the State of Missouri and in the jurisdiction in which the Project is located.

By:_____
Title:_____
Date:_____

(Attach seal and Power of Attorney)

CITY OF FOUNTAINS
HEART OF THE NATION

KANSAS CITY
MISSOURI

PAYMENT BOND

Project/Contract Numbers 80002543/9911_____

Project Title Vertical Wells 2-5 Replacement_____

KNOW ALL MEN BY THESE PRESENTS: That _____, as PRINCIPAL (CONTRACTOR), and_____, (SURETY), licensed to do business as such in the State of Missouri, hereby bind themselves and their respective heirs, executors, administrators, successors, and assigns unto Kansas City, Missouri, a constitutionally chartered municipal corporation, (OWNER), as obligee, in the penal sum of _____ Dollars ($_____) for the payment whereof CONTRACTOR and SURETY bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS,

CONTRACTOR has entered into a contract with OWNER for (80002543/9911 Vertical Wells 2.5 Replacement), which Contract, including any present or future amendment thereto, is incorporated herein by reference and is hereinafter referred to as the Contract.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that, if in connection with the Contract, including all duly authorized modifications thereto, prompt payment shall be made to all laborers, subcontractors, teamsters, truck drivers, owners or other suppliers or for equipment employed on the job, and other claimants, for all labor performed in such work whether done for CONTRACTOR, a subcontractor, SURETY, a completion contractor or otherwise (at the full wage rates required by any law of the United States or of the State of Missouri, where applicable), for services furnished and consumed, for repairs on machinery, for equipment, tools, materials, lubricants, oil, gasoline, water, gas, power, light, heat, oil, telephone service, grain, hay, feed, coal, coke, groceries and foodstuffs, either consumed, rented, used or reasonably required for use in connection with the construction of the work or in the performance of the Contract and all insurance premiums, both for compensation and for all other kinds of insurance on the work, for sales taxes and for royalties in connection with, or incidental to, the completion of the Contract, in all instances whether the claim be directly against CONTRACTOR, against SURETY or its completion contractor, through a subcontractor or otherwise, and, further, if CONTRACTOR shall defend, indemnify and hold harmless OWNER from all such claims, demands or suits by any such person or entity, then this obligation shall be void; otherwise, it shall remain in full force and effect.

Any conditions legally required to be included in a Payment Bond on this Contract, including but not limited to those set out in §107.170 RSMo.are included herein by reference.

SURETY agrees that, in the event that CONTRACTOR fails to make payment of the obligations covered by this Bond, it will do so and, further, that within forty-five (45) days of receiving, at the address given below, a claim hereunder stating the amount claimed and the basis for the claim in reasonable detail, it (a) will send an answer to the claimant, with a copy to OWNER stating the amounts that are undisputed and the basis for challenging any amounts that are disputed, and (b) will pay any amounts that are undisputed. The amount of this Bond shall be reduced by and to the extent of any payment or payments made in good faith hereunder.

While this Bond is in force, it may be sued on at the instance of any party to whom any such payment is due, in the name of OWNER to the use for such party. OWNER shall not be liable for the payment of any costs or expenses of any such suit.

No suit shall be commenced or pursued hereunder other than in a state court of competent jurisdiction in Jackson, Clay or Platte County, Missouri, or in the United States District Court for the Western District of Missouri.

WAIVER. That SURETY, for value received, hereby expressly agrees that no change, extension of time, alteration or addition to the terms of the Contract or to the Work to be performed thereunder, shall in any way affect the obligations of this Bond; and it does hereby waive notice of any such change, extension of time, or alteration or addition to the terms of the Contract or the Work to be performed thereunder.

IN WITNESS WHEREOF, the above parties have executed this instrument the _____ day of_____ _____, 20____.

CONTRACTOR
Name, address and facsimile number of Contractor

_____
_____
_____
_____

I hereby certify that I have authority to execute this document on behalf of Contractor.

By: _____
Title:_____

(Attach corporate seal if applicable)

SURETY
Name, address and facsimile number of Surety:

_____
_____
_____
_____

I hereby certify that (1) I have authority to execute this document on behalf of Surety; (2) Surety has an A.M. Best rating of A-. or better; (3) Surety is 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 (most current revision) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury; and(4) Surety is duly licensed to issue bonds in the State of Missouri and in the jurisdiction in which the Project is located.

By:_____
Title:_____
Date:_____

(Attach seal and Power of Attorney)

CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY)

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER	CONTACT NAME:
AGENT NAME AND ADDRESS	PHONE (A/C, No, Ext): / FAX (A/C, No):
	E-MAIL ADDRESS:
	INSURER(S) AFFORDING COVERAGE / NAIC #
	INSURER A : ABC INSURANCE COMPANY
INSURED	INSURER B :
CONTRACTOR NAME AND ADDRESS	INSURER C :
	INSURER D :
	INSURER E :
	INSURER F :

COVERAGES **CERTIFICATE NUMBER:** **REVISION NUMBER:**

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSR	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
A	**GENERAL LIABILITY** ☑ COMMERCIAL GENERAL LIABILITY ☐ CLAIMS-MADE ☑ OCCUR GEN'L AGGREGATE LIMIT APPLIES PER: ☐ POLICY ☑ PRO-JECT ☐ LOC	Y	Y	POLICY NUMBER	1/1/2011	Current	EACH OCCURRENCE DAMAGE TO RENTED PREMISES (Ea occurrence) MED EXP (Any one person) PERSONAL & ADV INJURY GENERAL AGGREGATE PRODUCTS - COMP/OP AGG $	$ 1,000,000 $ 50,000 $ 10,000 $ 1,000,000 $ 2,000,000 $ 2,000,000 $
A	**AUTOMOBILE LIABILITY** ☑ ANY AUTO ALL OWNED AUTOS ☐ SCHEDULED AUTOS ☑ HIRED AUTOS ☑ NON-OWNED AUTOS	Y	Y	POLICY NUMBER	1/1/2011	Current	COMBINED SINGLE LIMIT (Ea accident) BODILY INJURY (Per person) BODILY INJURY (Per accident) PROPERTY DAMAGE (Per accident) $	$ 1,000,000 $ $ $ $
A	☑ **UMBRELLA LIAB** ☑ OCCUR **EXCESS LIAB** ☐ CLAIMS-MADE DED ☑ RETENTION $ 10,000	Y	Y	POLICY NUMBER	1/1/2011	Current	EACH OCCURRENCE AGGREGATE $	$ 2,000,000 $ 2,000,000 $
A	**WORKERS COMPENSATION AND EMPLOYERS' LIABILITY** ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? Y/N: N **(Mandatory in NH)** If yes, describe under DESCRIPTION OF OPERATIONS below	N/A	Y	POLICY NUMBER	1/1/2011	Current	☑ WC STATU-TORY LIMITS ☐ OTH-ER E.L. EACH ACCIDENT E.L. DISEASE - EA EMPLOYEE E.L. DISEASE - POLICY LIMIT	 $ 1,000,000 $ 1,000,000 $ 1,000,000
A	Leased/Rented/Equip. Owned Equipment Builders Risk/Installation Floater	N/A	Y	POLICY NUMBER	1/1/2011	Current	Limit; Deductible Limit; Deductible Limit; Deductible	

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (Attach ACORD 101, Additional Remarks Schedule, if more space is required)

Project No. _____ [Title]. Certholder (City) and _____ (Design Professional) and any other entities named in 00800 SCs are named as primary, noncontributing Additional Insureds including products and completed operations, excluding workers compensation, employers liability and professional liability. Waiver of subrogation applies as allowed by law. [The policies required above shall contain no exclusions for work expressly within the subcontractors scope of work.]

CERTIFICATE HOLDER

City of Kansas City, Missouri

_____ [Department]

_____ [Address]

Kansas City, MO _____ [Zip]

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE

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FORM **RD-C1**
(12/20)

City of Kansas City, Missouri - Revenue Division

AUTHORIZATION TO RELEASE A REVENUE CLEARANCE LETTER

Phone: (816) 513-1120
Fax: (816) 513-1264

KANSAS CITY MISSOURI

I authorize the City of Kansas City, Missouri, Finance Department, Revenue Division, to release a Revenue Clearance Letter for:

Name of taxpayer: _____ FEIN or SSN: _____
(PRINT)
Address: _____

Check this box and complete this section to send the Clearance Letter to a contractor.

☐ **I authorize the City to provide a copy of the Taxpayer's Revenue Clearance Letter to the following:**

NAME (PRINT)		BUSINESS NAME	TITLE
ADDRESS		CITY, STATE, ZIP CODE	
PHONE NUMBER	FAX NUMBER	EMAIL ADDRESS	

☐ **I authorize the City to provide the Taxpayer's Revenue Clearance Letter to all City Departments to certify that the Taxpayer is in compliance with the tax ordinances administered by the Commissioner of Revenue.**

Please send my first Revenue Clearance Letter to: _____
(Print Name of City Department / Contact Person / Email / Fax Number)

This authorization shall expire one (1) year from the date on the bottom of this form.

The City, Commissioner of Revenue and the Revenue Division personnel (hereinafter "the City"), are hereby held harmless from any and all liability relating to unauthorized disclosure of confidential tax information resulting from release of information under all applicable confidentiality laws including federal, state, or local, including any damages sustained by wrongful transmission of confidential tax information to any other person.

UNDER PENALTIES OF PERJURY, I DECLARE THAT I HAVE EXAMINED THIS AUTHORIZATION, AND TO THE BEST OF MY KNOWLEDGE AND BELIEF, IT IS TRUE, CORRECT AND COMPLETE.

I hereby certify that I am the Taxpayer named herein or that I have the authority to execute this authorization on behalf of the Taxpayer and hold harmless agreement.

NAME (PRINT)	TITLE (IF APPLICABLE)	
SIGNATURE	PHONE NUMBER	DATE

A FACSIMILE OF THIS DOCUMENT SHALL CONSTITUTE AN ORIGINAL

Email completed form to business.license@kcmo.org or mail to:

City of Kansas City, Missouri, Business License Office, City Hall, 1st floor, 414 E. 12th St., Kansas City, MO 64106

KANSAS CITY
MISSOURI

Finance Department

Revenue Division

414 E 12th St. 1st Floor
Kansas City, MO 64106-2786

DO NOT MAIL
atL003

Phone: (816) 513-1120
Fax: (816) 513-1264
Email: revenue@kcmo.org
Website: kcmo.gov/tax

Letter Id: L0000143555
Date: 07-Feb-2024
Taxpayer Id: 0000161779

EXAMPLE TAXPAYER
414 E 12TH ST
KANSAS CITY MO 64106-2702

TAX CLEARANCE STATUS: APPROVED

As of this date, this notice is to inform you that EXAMPLE TAXPAYER is current with all taxes and license fees with the City of Kansas City, Mo., Finance Department/ Revenue Division.

Please note this could change if we perform a full review of your accounts in the future. We will let you know if we need to review your accounts. You will need to pay any amounts that are found due at that time.

Eric Davison
Commissioner of Revenue

Visit kcmo.gov/quicktax to view the status of your account and for online filing.

CITY OF FOUNTAINS
HEART OF THE NATION

KANSAS CITY
MISSOURI

GENERAL CONDITIONS
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ARTICLE 1 DEFINITIONS AND TERMINOLOGY

1.01 Defined Terms

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

2. Agreement—The written Contract between CITY and CONTRACTOR governing the Work to be performed; other Contract Documents are attached to the Agreement and made a part thereof as provided therein.

3. Application for Payment—The form accepted by CITY's Representative 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.

4. Asbestos - Any material that contains more than one percent (1%) 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.

5. Bid- The offer or proposal of the Bidder submitted on the Bid Form/Contract setting forth the prices for the Work to be performed. A Bidder's Bid becomes a Contract with CITY if the CITY executes the Bid Form/Contract submitted by Bidder. If the CITY executes the Bid Form/Contract submitted by Bidder, the term "Bidder" shall mean CONTRACTOR.

6. Bidder- One who submits a Bid directly to CITY, as distinct from a sub-bidder who submits a bid to a Bidder. If the CITY executes the Bid Form/Contract submitted by Bidder, the term "Bidder" shall mean CONTRACTOR in both the Bidding Documents and Contract Documents unless the context clearly indicates otherwise.

7. Bidding Documents- The advertisement or Invitation to Bid, Instructions to Bidders, the Bid Form/Contract, and the proposed Contract Documents (including all Addenda issued prior to receipt of Bids).

8. Bidding Requirements- The advertisement or invitation to bid, Instructions to Bidders, Bid security, and the Bid Form/Contract with any supplements.

9. Bonds- Payment Bond and Performance and Maintenance Bond and other instruments of security.

10. Calendar Day- Any day shown on the calendar, including Saturdays, Sundays, and holidays.

11. Change Order- A written document issued by CITY that 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 Contract.

12. CITY/OWNER- Kansas City, Missouri, a constitutionally chartered municipal corporation, with which CONTRACTOR has entered into the Contract and for whom the Work is to be provided**.**

13. CITY's Representative- Person or agency designated to act for the Director as provided in these Contract Documents.

14. Consultant- Person, firm or corporation having a contract with CITY or DESIGN PROFESSIONAL to furnish services as an independent professional associate or Consultant with respect to the Project and who's identified as such in the Supplementary Conditions.

The Consultant(s) is identified and their seals affixed on the Certification Page(s). The certifications describe the respective responsibilities for the Drawings and Specifications prepared by the Consultant(s) and are incorporated into this Contract.

15. Contract- The entire and integrated written agreement between CITY and CONTRACTOR concerning the Work that incorporates all Contract Documents. The Bid Form/Contract submitted by Bidder is the Contract between CITY and CONTRACTOR upon execution by CITY. The Contract supersedes prior negotiations, representations, or agreements, whether written or oral.

16. Contract Documents- The Contract Documents establish the rights and obligations of the parties and include the Contract, Addenda (which pertain to the Contract Documents), CONTRACTOR's Bid Form/Contract (including documentation accompanying the Bid and any post Bid documentation submitted prior to the Notice of Intent to Contract), the Construction Project Instructions, the Contractor's Utilization Plan/Request for Waiver, 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 Project Manual and the certification page(s) of the DESIGN PROFESSIONAL and Consultant(s), together with approved project baseline schedule and amendments thereto and all Written Amendments, Change Orders, Work Change Directives, and DESIGN PROFESSIONAL's written interpretations and clarifications issued on or after the Effective Date of the Contract, and approved Shop Drawings. Reports and drawings of subsurface and physical conditions are not Contract Documents. Only printed or hard copies of the items listed in this Paragraph are Contract Documents. Files in electronic media format of text, data, graphics, and the like that may be furnished by CITY to CONTRACTOR are not Contract Documents, except project schedules submitted by CONTRACTOR and approved by CITY.

17. Contract Price- The money payable by CITY to CONTRACTOR for completion of the Work in accordance with the Contract Documents as stated in the Agreement.

18. Contract Times- The number of days or the dates stated in the Supplementary Conditions: (a) to achieve Substantial Completion, and (b) to complete the Work so that it is ready for final payment as evidenced by CITY's Representative's written recommendation of final payment.

19. CONTRACTOR- The person, firm, partnership, company, corporation or association licensed or otherwise authorized by law to do business in Missouri, with whom CITY has entered into the Agreement.

20. Day– Shall constitute a Calendar Day.

21. DESIGN PROFESSIONAL- Architect, Engineer or other licensed professional who is either employed by or has contracted with CITY to serve in a design capacity and whose Consultants, members, partners, employees or agents have prepared and sealed the Drawings and Specifications.

The DESIGN PROFESSIONAL(s) is identified and their seals affixed on the Certification Page(s). The certifications describe the respective responsibilities for the Drawings and Specifications prepared by the DESIGN PROFESSIONAL and are incorporated into this Contract.

22. DESIGN PROFESSIONAL's Project Representative- The authorized representative of DESIGN PROFESSIONAL who may be assigned to the Site or any part thereof.

23. Director- The term Director shall mean the duly appointed executive officer of a department of City who is empowered by the City Charter or by the City Council to enter into a contract on behalf of City, or to grant a permit for improvements to land owned by City. A Director is authorized to delegate this authority to a City employee so designated in writing.

24. Drawings- The drawings which graphically show the scope, extent and character of the Work to be furnished and performed by CONTRACTOR and which have been prepared by DESIGN PROFESSIONAL and are included in the Contract Documents. Shop Drawings are not Drawings as so defined.

25. Effective Date of the Contract- The date indicated in the Contract on which it becomes effective, but if no such date is indicated it means the date on which the Contract is fully executed by CITY.

26. General Requirements- Sections of Division 1 of the Specifications. The General Requirements pertain to all sections of the Specifications.

27. Hazardous Environmental Condition- The presence at the Site of Asbestos, Lead-Based Paint, PCBs, Petroleum, Hazardous Waste, or Radioactive Material in such quantities or circumstances that may present a substantial danger to persons or property exposed thereto in connection with the Work.

28. 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.

29. 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.

30. Lead-Based Paint- Any paint, varnish, stain, or other applied coating that has one (1) mg or more of lead per square centimeter. The terms “leaded paint” and “lead-containing paint” are synonymous with Lead-Based Paint.

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

32. 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.

33. Notice of Intent to Contract- The written notice by CITY to the apparent successful Bidder stating that upon compliance by that apparent successful Bidder with the conditions in the Bid Documents enumerated, within the time specified, and upon enactment of an appropriate ordinance or resolution, CITY will sign and deliver the Contract.

34. Notice to Proceed- A written notice given by CITY to CONTRACTOR 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.

35. Partial Utilization- Use by CITY 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.

36. PCBs- Polychlorinated biphenyls.

37. 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.

38. 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.

39. Project Manual- The documentary information prepared for bidding and constructing the Work. A listing of the contents of the Project Manual may be issued in one or more volumes and is contained in the table(s) of contents.

40. 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.

41. 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.

42. 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.

43. Site- Lands or areas indicated in the Contract Documents as being furnished by CITY upon which the Work is to be performed, including rights-of-way and easements for access thereto, and such other lands furnished by CITY which are designated for the use of CONTRACTOR.

44. 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.

45. Subcontractor- Any individual, firm, partnership, company, corporation or association licensed or otherwise authorized by law to do business in Missouri, to whom CONTRACTOR, with written notification to CITY, has entered into an agreement to perform a part of the Work.

46. Substantial Completion- When Work (or a specified part thereof) has progressed to the point where, in the opinion of DESIGN PROFESSIONAL as evidenced by DESIGN PROFESSIONAL'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. The terms "substantially complete" and "substantially completed" as applied to all or part of the Work refer to Substantial Completion thereof.

47. Supplementary Conditions- The part of the Contract Documents which amends and/or supplements these General Conditions.

48. Supplier- A manufacturer, fabricator, supplier, distributor, materialman or vendor having a direct contract with CONTRACTOR or with any Subcontractor to furnish materials or equipment to be incorporated into the Work by CONTRACTOR or any Subcontractor.

49. Underground Facilities- All pipelines, 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, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.

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

51. 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 material and equipment into the construction, and furnishing documents, all as required by the Contract Documents.

52. Work Change Directive- A written directive to CONTRACTOR, issued on or after the Effective Date of the Contract, signed by CITY and recommended by DESIGN PROFESSIONAL, ordering an addition, deletion or revision in the Work, or responding to differing or unforeseen subsurface or physical conditions under which the Work is to be performed, or to emergencies. A 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.

53. Work Day - Any day during which the CONTRACTOR is able to work a period of six (6) hours or more. Days that are not Work Days are days during which the CONTRACTOR is unable to work for a period of six (6) hours by reason of strikes, boycotts, labor disputes, embargoes, unusual delays in transportation or shortage of material, acts of God, acts of the public enemy, acts of superior governmental authority, weather conditions, riots, rebellion, sabotage, or any other circumstances for which CONTRACTOR is not responsible or which is not within its control. Saturdays, Sundays, and holidays on which the CONTRACTOR's forces engage in Work requiring the presence of an inspector, will be considered as Work Days.

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

1.02 Terminology

A. Intent of Certain Terms or Adjectives

1. 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 DESIGN PROFESSIONAL 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 DESIGN PROFESSIONAL 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 9.08 or any other provision of the Contract Documents.

B. Defective

1. The word "defective," when modifying the word "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 CITY 's Representative's recommendation of final payment (unless responsibility for the protection thereof has been assumed by CITY at Substantial Completion in accordance with Paragraph 14.04 or 14.05).

C. Furnish, Install, Perform, Provide

1. The word "furnish," when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.

2. The word "install," when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.

3. The words "perform" or "provide," when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.

4. When “furnish,” “install,” “perform,” or “provide” is not used in connection with services, materials, or equipment in a context clearly requiring an obligation of CONTRACTOR, “provide” is implied.

D. Unless stated otherwise in the Contract Documents, words and phrases which have a well-known technical or construction industry or trade meanings are used in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2 PRELIMINARY MATTERS

2.01 Delivery of Bonds

A. CONTRACTOR shall deliver to CITY such Bonds as CONTRACTOR may be required to furnish.

2.02 Evidence of Insurance

A. CONTRACTOR shall deliver to CITY certificates of insurance or other evidence of insurance that CITY may request, which CONTRACTOR is required to purchase and maintain in accordance with Article 5 or any other applicable provision in the Contract Documents.

2.03 Copies of Documents

A. CITY shall furnish to CONTRACTOR one (1) copy of the Drawings and Specifications, including addenda.

2.04 Commencement of Contract Times; Notice to Proceed

A. The Contract Times will commence to run on the date indicated in the Notice to Proceed.

2.05 Starting the Work

A. 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, unless otherwise indicated in the Notice to Proceed.

2.06 Before Starting Construction

A. CONTRACTOR's Review of Contract Documents: 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 DESIGN PROFESSIONAL any conflict, error, ambiguity or discrepancy which CONTRACTOR may discover and shall obtain a written interpretation or clarification from DESIGN PROFESSIONAL before proceeding with any Work affected thereby. CONTRACTOR shall not be liable to CITY or DESIGN PROFESSIONAL for failure to report any conflict, error, ambiguity or discrepancy in the Contract Documents, unless CONTRACTOR knew or reasonably should have known thereof.

B. Preliminary Schedules: Within ten (10) days after the Effective Date of the Contract, or on such later date as CITY's Representative shall provide in writing, CONTRACTOR shall submit to CITY's Representative for review:

1. Preliminary Project Schedule: CONTRACTOR shall submit a proposed project schedule for CITY’s acceptance. The proposed project schedule shall include a detailed and comprehensive construction schedule utilizing a critical path method diagram network that (a) shows all major procurement and construction elements and phases of the Project; (b) breaks down each element or phase by trade; (c) shows early and late starts so that all float time will be accurately identified; (d) all other activities necessary for the timely completion of the Project in accordance with the scheduled dates for Substantial and Final Completion; and (e) highlights the project’s critical path. CITY’s acceptance is expressly limited to CITY’s acknowledgement that, based upon CITY’s limited review, the dates of Substantial

Completion and Milestone dates are acceptable. After final acceptance of the preliminary project schedule by the CITY, it shall be considered the project baseline schedule pursuant to Paragraph 2.07(B).

2. Preliminary schedule of Shop Drawings and Sample submittals which will list each required submittal and the times for submitting, reviewing and processing such submittal; and

3. Preliminary 01290.02 Schedule of Values for all of the Work which will include quantities and prices of items which when added together equals the Contract Price and will subdivide the Work into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

C. Preconstruction Conference: Before any Work at the Site may be started, a conference attended by CONTRACTOR, DESIGN PROFESSIONAL and others, as appropriate, will be scheduled by CITY's Representative to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in Paragraph 2.06 B, procedures for handling Shop Drawings and other submittals, processing Applications for Payment, maintaining required records, Claims process, dispute resolution or any other applicable provisions of the Contract Documents.

2.07 Acceptable Schedules

A. Acceptable schedule: The Contractor shall update and submit to the CITY for review the preliminary schedule within seven (7) Calendar Days after the Notice to Proceed.

1. The CITY shall review and make any necessary comments and/or adjustments to the updated preliminary schedule. The Contractor shall incorporate the CITY's comments and resubmit the updated preliminary schedule within seven (7) Calendar Days from receipt of the CITY's comments.

B. Project Baseline Schedule: The accepted updated preliminary schedule shall be considered the project baseline schedule and shall be used by the CONTRACTOR for planning, scheduling, managing, and executing the Work. The project baseline schedule shall not be changed without the written consent of CITY. The project baseline schedule may be further modified by the Supplemental Conditions.

C. CONTRACTOR's schedule of values will be acceptable to CITY's Representative as to form and substance if it provides a reasonable allocation of the Contract Price to component parts of the Work.

ARTICLE 3 CONTRACT DOCUMENTS : INTENT, AMENDING, REUSE

3.01 Intent

A. The Contract Documents comprise the entire Contract between CITY and CONTRACTOR concerning the Work.

B. 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 at no additional cost to CITY. Clarifications and interpretations of the Contract Documents shall be issued by DESIGN PROFESSIONAL as provided in Paragraph 9.03.

C. Correlation and intent of documents: The Drawings and Specifications are intended to supplement each other. Any Work shown on the Drawings and not mentioned in the Specifications (or vice versa) shall be as binding and shall be completed the same as if mentioned or shown on both. In the event of conflicts or discrepancies among the Contract Documents, interpretations will be based on the following priorities:

1. Change Orders and Written Amendments
2. Project Baseline Schedule Requirements
3. Approved Shop Drawings
4 Addenda, with those of later date having precedence over those of earlier date
5. The Supplementary Conditions
6. The General Conditions
7. Drawings and Specifications

D. In the case of an inconsistency between Drawings and Specifications, the requirements of the Specifications shall govern. If Drawings are in conflict, larger scale details shall govern over smaller or no-scale Drawings. If Specification sections are in conflict with each other, the conflict shall be resolved by DESIGN PROFESSIONAL in accordance with reasonable interpretation of such documents.

E. The general character of the detailed Work is shown on the Drawings, but minor modifications may be made in the full size or scale details. Where the word “similar” occurs on the Drawings, it shall be used in its general sense and not as meaning identical, and all details shall be worked out in relation to their location and their connection to the other parts of the Work. Where on any Drawings a portion of the Work is drawn out and the remainder is indicated in outline, the parts drawn out shall apply also to all other like portions of the Work. Where ornaments or other details are indicated by starting only, such details shall be continued throughout the courses or parts in which they occur and shall also apply to all other similar parts in the Work, unless otherwise indicated.

3.02 Reference to Standards and Specifications of Technical Societies

A. Reference to standards, specifications, manuals or codes of any technical society, organization or association, or to Laws or Regulations, 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 date of CONTRACTOR’s proposal if there are no Bids), except as may be otherwise specifically stated in the Contract Documents.

1. No provision of any such standard, specification, manual, code or instruction of Supplier shall be effective to change the duties or responsibilities of CITY, CONTRACTOR or DESIGN PROFESSIONAL, 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 CITY or DESIGN PROFESSIONAL or any of their 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 the Contract Documents.

3.03 Reporting and Resolving Discrepancies

A. Reporting Discrepancies: 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 Laws or Regulations applicable to the performance of the Work or of any standard, specification, manual, code or any instruction of any Supplier referred to in Paragraph 6.07, CONTRACTOR shall report it immediately to DESIGN PROFESSIONAL in writing. CONTRACTOR shall not proceed with the Work affected thereby (except in an emergency as authorized by Paragraph 6.17) until an amendment or supplement to the Contract Documents has been issued by one of the methods indicated in Paragraph 3.04; provided, however, that CONTRACTOR shall not be liable to CITY or DESIGN PROFESSIONAL for failure to report any such conflict, error, ambiguity or discrepancy unless CONTRACTOR knew or reasonably should have known thereof.

B. Resolving Discrepancies. 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:

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

2. the provisions of any Laws or Regulations applicable to the performance of the Work.

3.04 Amending and Supplementing Contract Documents

A. 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:

1. a Written Amendment or

2. a Change Order (pursuant to Article 10), whether pursuant to a Work Change Directive or otherwise.

B. 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

1. DESIGN PROFESSIONAL's approval of a Shop Drawing or Sample (pursuant to Paragraph 6.18), or

2. DESIGN PROFESSIONAL's written interpretation or clarification (pursuant to Paragraph 9.03).

3.05 Reuse of Documents

A. CONTRACTOR and any Subcontractor or Supplier or other person or organization performing or furnishing any of the Work under this Contract:

1. 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 DESIGN PROFESSIONAL or Consultant, and

2. shall not reuse any of such Drawings, Specifications, other documents or copies thereof on extensions of the Project or any other project without written consent of CITY, and of DESIGN PROFESSIONAL or Consultant, as applicable, and specific written verification or adaptation by DESIGN PROFESSIONAL or Consultant.

This prohibition will survive final payment, completion, and acceptance of the Work, or termination or completion of the Contract. Nothing herein shall preclude CONTRACTOR from retaining copies of the Contract Documents for record purposes.

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

4.01 Availability of Lands

A. CITY shall furnish the Site. CITY 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 CITY, unless otherwise provided in the Contract Documents. If CONTRACTOR and CITY are unable to agree on entitlement to or the amount or extent of any adjustments in the Contract Price or the Contract Times or both as a result of any delay in CITY's furnishing these lands, rights-of-way or easements, CONTRACTOR may make a Claim as provided in Article 16. CONTRACTOR shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

4.02 Subsurface and Physical Conditions

A. Reports and Drawings: Reference is made to the Supplementary Conditions for identification of:

1. Subsurface Conditions: Those reports of explorations and tests of subsurface conditions at or contiguous to the Site that have been utilized by DESIGN PROFESSIONAL in preparing the Contract Documents; and

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 DESIGN PROFESSIONAL in preparing the Contract Documents.

B. Limited Reliance by CONTRACTOR on Technical Data Authorized: CONTRACTOR may rely upon the general accuracy of the technical data contained in reports and drawings of subsurface or physical conditions, but such reports and drawings are not Contract Documents. The technical data is identified in the Supplementary Conditions. Except for reliance on such technical data, CONTRACTOR may not rely upon or make any Claim against CITY, DESIGN PROFESSIONAL or any Consultant with respect to:

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

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

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

4.03 Differing Subsurface or Physical Conditions

A. Notice of Differing Subsurface or Physical Conditions. If CONTRACTOR believes that any subsurface or physical condition at or contiguous to the Site that is uncovered or revealed either:

1. is of such a nature as to establish that any technical data on which CONTRACTOR is entitled to rely as provided in Paragraphs 4.02 A and 4.02 B is materially inaccurate; or

2. is of such a nature as to require a change in the Contract Documents; or

3. differs materially from that shown or indicated in the Contract Documents; or

4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents; then CONTRACTOR shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 6.17), notify CITY and DESIGN PROFESSIONAL in writing about such condition(s). CONTRACTOR shall not further disturb such conditions or perform any Work in connection therewith (except as aforesaid) until receipt of written order to do so.

B. DESIGN PROFESSIONAL's Review: After receipt of notice as required by Paragraph 4.03 A, DESIGN PROFESSIONAL will promptly review the pertinent conditions, determine the necessity for CITY to obtain additional exploration or tests with respect thereto and notify CITY in writing (with a copy to CONTRACTOR) of DESIGN PROFESSIONAL's findings and conclusions.

C. Possible Contract Documents Change: If CITY concludes that a change in the Contract Documents is required as a result of a condition that meets one or more of the categories in Paragraph 4.03 A, a Work Change Directive or a Change Order will be issued as provided in Article 10 to reflect and document the consequences of such change.

D. Possible Price or Times Adjustments: An equitable adjustment in the Contract Price or in the Contract Times, or both, will be allowed to the extent that the existence of a subsurface or physical condition causes an increase or decrease in CONTRACTOR's cost of, or time required for, performance of the Work; subject, however, to the following:

1. the condition must meet any one or more of the categories described in Paragraphs 4.03 A.1 through 4.03 A.4, inclusive;

2. a change in the Contract Documents pursuant to Paragraph 4.03 C will not be an automatic authorization of, nor a condition precedent to, entitlement to any such adjustments;

3. with respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraphs 9.06 and 11.04; and

4. CONTRACTOR shall not be entitled to any adjustment in the Contract Price or Contract Times if;

a. CONTRACTOR knew, or by the exercise of ordinary care could have known, of such conditions at the time CONTRACTOR made a final commitment to CITY with respect to Contract Price and Contract Times by the submission of a Bid; or

b. 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; or

c. CONTRACTOR failed to give the written notice as required by Paragraph 4.03 A.

E. If CITY and CONTRACTOR are unable to agree on entitlement to, or magnitude of, an equitable adjustment in the Contract Price pursuant to Article 11 and/or Contract Times pursuant to Article 12, a Claim may be made therefore as provided in Article 16. However, CITY, DESIGN PROFESSIONAL and Consultants shall not be liable to CONTRACTOR for any costs, losses or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all other dispute resolution costs) sustained by CONTRACTOR on or in connection with any other project or anticipated project.

4.04. Physical Conditions – Underground Facilities

A. 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 CITY or DESIGN PROFESSIONAL by the owners of such Underground Facilities or by others.

1**.** CITY and DESIGN PROFESSIONAL shall not be responsible for the accuracy or completeness of any such information or data; and

2. The cost of all of the following will be included in the Contract Price and CONTRACTOR shall have full responsibility for:

a. reviewing and checking all such information and data,

b. locating all Underground Facilities shown or indicated in the Contract Documents,

c. coordination of the Work with the owners of such Underground Facilities during construction, and

d. the safety and protection of all such Underground Facilities as provided in Paragraph 6.14 and repairing any damage thereto resulting from the Work.

B. Not Shown or Indicated: If an Underground Facility is uncovered or revealed at or contiguous to the Site, and was not shown or indicated in the Contract Documents, or was

shown or indicated incorrectly 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 6.17), identify the owner of such Underground Facility and give written notice to that owner and to CITY and DESIGN PROFESSIONAL.

C. DESIGN PROFESSIONAL's Review: After receipt of notice as required by Paragraph 4.04 B, DESIGN PROFESSIONAL will promptly review the consequences of the existence of the Underground Facility and notify CITY in writing (with a copy to CONTRACTOR) of DESIGN PROFESSIONAL's findings and conclusions.

D. Possible Contract Documents Change: If CITY concludes that a change in the Contract Documents is required as a result of the existence of an Underground Facility that either was not shown, or was shown incorrectly, in the Contract Documents, a Work Change Directive or Change Order will be issued as provided in Article 10 to reflect and document the consequences of such change.

E. Possible Price or Times Adjustments: An equitable adjustment in the Contract Price or in the Contract Times, or both, will be allowed to the extent that the existence of the Underground Facility causes an increase or decrease in CONTRACTOR's cost of, or time required for, performance of the Work; subject, however, to the following:

1. a change in the Contract documents pursuant to Paragraph 4.04 D will not be an automatic authorization of, nor a condition precedent to, entitlement to any such adjustments;

2. with respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraphs 9.06 and 11.04; and

3. CONTRACTOR shall not be entitled to any adjustment in the Contract Price or Contract Times if;

a. CONTRACTOR knew, or by the exercise of ordinary care could have known, of the existence of the Underground Facility at the time CONTRACTOR made a final commitment to CITY with respect to Contract Price and Contract Times by the submission of a Bid; or

b. the existence of the Underground Facility 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; or

c. CONTRACTOR failed to give the written notice as required by Paragraph 4.04 B.

F. If CITY and CONTRACTOR are unable to agree on entitlement to, or magnitude of, an equitable adjustment in the Contract Price pursuant to Article 11 and/or Contract Times pursuant Article 12, a Claim may be made therefore as provided in Article 16. However, CITY, DESIGN PROFESSIONAL and Consultants shall not be liable to CONTRACTOR for any costs, losses or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all other dispute resolution costs) sustained by CONTRACTOR on or in connection with any other project or anticipated project.

4.05 Reference Points

A. CITY shall provide engineering surveys to establish reference points for construction that in DESIGN PROFESSIONAL'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 property monuments, and shall make no changes or relocations without the prior written approval of CITY. CONTRACTOR shall report to DESIGN PROFESSIONAL whenever any reference point or property monument 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 or property monuments by professionally qualified personnel.

4.06 Asbestos, Lead-Based Paint, PCBs, Petroleum, Hazardous Waste or Radioactive Material

A. Reports and Drawings: Reference is made to the Supplementary Conditions for the identification of those reports and drawings relating to a Hazardous Environmental Condition identified at the Site, if any, that have been utilized by the DESIGN PROFESSIONAL in the preparation of the Contract Documents.

B. Limited Reliance by CONTRACTOR on Technical Data Authorized: CONTRACTOR may rely upon the general accuracy of the technical data contained in reports and drawings relating to a Hazardous Environmental Condition at the Site, but such reports and drawings are not Contract Documents. Such technical data is identified in the Supplementary Conditions. Except for such reliance on such technical data, CONTRACTOR may not rely upon or make any Claim against CITY, DESIGN PROFESSIONAL or any Consultant with respect to:

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

2. other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings; or

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

C. CONTRACTOR shall not be responsible for any Hazardous Environmental Condition 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. CONTRACTOR shall be responsible for all Hazardous Environmental Conditions created with any materials brought to the Site by CONTRACTOR, Subcontractors, Suppliers, or anyone else for whom CONTRACTOR is responsible. CONTRACTOR shall not be entitled to an extension of the Contract Times or an increase in the Contract Price if CONTRACTOR, Subcontractor, Supplier or anyone for whom CONTRACTOR is responsible created any Hazardous Environmental Condition at the Site or in connection with the Work.

D. If CONTRACTOR encounters a Hazardous Environmental Condition at the Site or if CONTRACTOR or anyone for whom CONTRACTOR is responsible creates a Hazardous Environmental Condition at the Site, CONTRACTOR shall immediately:

1. secure or otherwise isolate such condition;

2. stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 6. 15); and

3. notify CITY and DESIGN PROFESSIONAL (and promptly thereafter confirm such notice in writing). CITY shall promptly consult with DESIGN PROFESSIONAL concerning the necessity for CITY to retain a qualified expert to evaluate such condition or take corrective action, if any.

E. CONTRACTOR shall neither resume Work nor be required to resume Work in connection with such condition or in any affected area until after CITY has obtained any required permits related thereto and delivered to CONTRACTOR written notice:

1. specifying that such condition and any affected area is or has been rendered safe for the resumption of Work; or

2. specifying any special conditions under which such Work may be resumed safely. If CITY and CONTRACTOR cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price pursuant to Article 11and/or Contract Times to

pursuant to Article 12 as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by CONTRACTOR, a Claim may be made therefore as provided in Article 16.

F. If after receipt of written notice as required in Paragraph 4.06 E, CONTRACTOR does not agree to resume Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under special conditions specified in the notice, then CITY may order the portion of the Work that is in the area affected by such condition to be deleted from the Work. If CITY and CONTRACTOR cannot agree as to entitlement to or magnitude of an equitable adjustment in Contract Price pursuant to Article 11and/or Contract Times pursuant to Article 12 as a result of deleting such portion of the Work, then a Claim may be made therefore as provided in Article 16. CITY may have such deleted portion of the Work performed by CITY's own forces or others in accordance with Article 7.

G. The provisions of Paragraphs 4.02, 4.03, and 4.04 are not intended to apply to a Hazardous Environmental Condition uncovered or revealed at the Site.

H. All materials used, whether new or salvaged, shall be asbestos-free materials. CONTRACTOR shall immediately call to the attention of the CITY's Representative any specified material or product which the CONTRACTOR knows or suspects to contain asbestos, whether new or salvaged.

ARTICLE 5 BONDS AND INSURANCE

5.01 Performance, Payment and Other Bonds

A. CONTRACTOR shall furnish Performance and Maintenance and Payment Bonds, each in an amount at least equal to the Contract Price, as set out in the Contract Documents, as security for the faithful performance and payment of all CONTRACTOR's obligations under the Contract Documents. These Bonds shall remain in effect at least until one (1) year after the date when final payment of the Contract 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.

B. All Bonds shall be in the form prescribed by the Contract Documents except as provided otherwise by Laws or Regulations. A certified copy of the agent's authority to act must accompany all Bonds signed by an agent.

C. If the surety on any Bond furnished by CONTRACTOR is declared bankrupt or becomes insolvent, or its right to do business is terminated in any state where any part of the Project is located or it ceases to meet the requirement of Paragraph 5.01 B, CONTRACTOR shall within twenty (20) days thereafter substitute another Bond and surety, both of which must be acceptable to CITY.

5.02 Licensed Sureties and Insurers

A. All Bonds and insurance required by the Contract Documents to be purchased and maintained by CITY or CONTRACTOR shall be obtained from surety or insurance companies that are duly licensed in the State of Missouri and in the jurisdiction in which the Project is located, if not in Missouri, to issue Bonds or insurance policies for the limits and coverages so required. All surety and insurance companies shall hold an A.M. Best rating of A-, V, or better.

5.03 Certificates of Insurance

A. CONTRACTOR shall deliver to CITY and DESIGN PROFESSIONAL, prior to the start of any Work at the Project Site, properly completed certificates of insurance or other evidence that the required insurance is in full force and effect, in a form acceptable to CITY. The receipt or acceptance of a certificate of insurance that does not incorporate the required terms and coverage shall not constitute a waiver by the City of the insurance requirements contained in the Contract Documents.

B. All policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained by CONTRACTOR in accordance with Paragraphs 5.04 and 5.06 will contain waiver provisions in accordance with Paragraph 5.07 A. The certificates of insurance will contain a provision stating that should any of the policies described in the certificate be cancelled before the expiration date thereof, notice will be delivered in accordance with the policy provisions.

C. If the coverage afforded is cancelled or changed or its renewal is refused, CONTRACTOR shall give at least thirty (30) days prior written notice to CITY and to each other additional insured to whom a certificate of insurance has been issued.

5.04 CONTRACTOR's Liability Insurance

A. CONTRACTOR shall purchase and maintain such liability and other insurance as is appropriate for the Work being performed and furnished, and will provide protection from claims set forth below which may arise out of or result from CONTRACTOR's performance and furnishing of the Work and CONTRACTOR's other obligations under the Contract Documents, whether it is to be performed or furnished by CONTRACTOR, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform or furnish any of the Work, or by anyone for whose acts any of them may be liable:

1. claims under workers' compensation, disability benefits and other similar employee benefit acts;

2. claims for damages because of bodily injury, occupational sickness or disease, or death of CONTRACTOR's employees;

3. claims for damages because of bodily injury, sickness or disease, or death of any person other than CONTRACTOR's employees;

4. claims for damages insured by customary personal injury liability coverage;

5. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefore; and

6. claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance or use of any motor vehicle.

B. The policies of insurance so required by Paragraph 5.04 A, to be purchased and maintained shall:

1. with respect to insurance required by Paragraphs 5.04 A.3 through 5.04 A.5 inclusive, include as additional insureds (subject to any customary exclusion for professional liability) CITY, DESIGN PROFESSIONAL, Consultants and any other individuals or entities identified in the Supplementary Conditions to be listed as additional insureds, and include coverage for the respective officers, directors, partners, employees, agents, and other consultants and subcontractors of each and any of all such additional insureds, and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby;

2. include at least the specific coverages and be written for not less than the limits of liability provided in Paragraph 5.04 C or required by Laws or Regulations, whichever is greater;

3. include completed operations insurance;

4. include contractual liability insurance covering CONTRACTOR's indemnity obligations;

5. remain in effect at least until final payment and at all times thereafter when CONTRACTOR may be correcting, removing or replacing defective Work in accordance with Paragraphs 13.06 and 13.07;

6. with respect to completed operations insurance, and any insurance coverage written on a claims-made basis, remain in effect for at least two (2) years after final payment (and CONTRACTOR shall furnish CITY and each other additional insured identified in the Supplementary Conditions to whom a certificate of insurance has been issued evidence satisfactory to CITY and any such additional insured of continuation of such insurance);

7. contain a cross-liability or severability of interest clause or endorsement. Insurance covering the specified additional insureds shall be primary insurance, and all other insurance carried by the additional insureds shall be excess insurance;

8. with respect to commercial automobile liability, commercial general liability, and umbrella liability insurance, CONTRACTOR shall require its insurance carrier(s) to waive all rights of subrogation against CITY, and CITY's officers, directors, partners, employees and agents; and

9. contain a provision or endorsement that the costs of providing the insureds a defense and appeal, including attorneys' fees, as insureds, shall be supplementary and shall not be included as part of the policy limits but shall remain the insurer's responsibility.

C. Specific policies of insurance required by this Paragraph 5.04 shall include:

1. Workers' Compensation and Employers' Liability Insurance. This insurance shall protect CONTRACTOR against all claims under applicable state workers''' compensation laws, including coverage as necessary for the benefits provided under the United States Longshoremen's and Harbor Workers' Act and the Jones Act. CONTRACTOR shall also be protected against claims for injury, disease, or death of employees which, for any reason, may not fall within the provisions of workers' compensation laws. This policy shall include an "all states" or "other states" endorsement. The liability limits shall be not less than:

Workers' Compensation: Statutory

Employers' liability: $1,000,000 each occurrence

2. Commercial Automobile Liability Insurance. This insurance shall be occurrence type written in comprehensive form and shall protect CONTRACTOR, and CITY, DESIGN PROFESSIONAL and Consultants against all claims for injuries to members of the public and damage to property of others arising from the use of motor vehicles, either on or off the Project Site, whether they are owned, non-owned, or hired.

   The liability limits shall be not less than: $2,000,000

3. Commercial General Liability Insurance. This insurance shall be occurrence type written in comprehensive form acceptable to CITY. This insurance shall protect CONTRACTOR, and CITY, DESIGN PROFESSIONAL and Consultants as additional insureds, against claims arising from injuries, sickness, disease, or death of any person or damage to property arising out of performance of the Work. The policy shall also include coverage for personal injury liability; contractual liability; completed operations and products liability; and for blasting, explosion, and collapse of buildings; and damage to underground property. The liability limits for bodily injury and property damage shall be not less than:

$2,000,000 combined single limit for each occurrence

$2,000,000 general aggregate.

4. The insurer's costs of providing the insureds a defense and appeal as additional insureds, including attorney's fees, shall be supplementary and shall not be included as part of the policy limits but shall remain the insurer's separate responsibility.

5.05 CITY's Liability Insurance

A. In addition to the insurance required to be provided by CONTRACTOR under Paragraph 5.04, CITY, at CITY's option, may purchase and maintain at CITY's expense liability insurance

that will protect CITY against claims which may arise from operations under the Contract Documents.

5.06 Property Insurance

A. Unless otherwise provided in the Supplementary Conditions, CONTRACTOR shall purchase and maintain property insurance on the Work at the Site in the amount of the full replacement cost thereof (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws or Regulations). This insurance shall:

1. include the interests of CITY, CONTRACTOR, Subcontractors, and any other persons or entities identified in the Supplementary Conditions, each of whom is deemed to have an insurable interest and shall be listed as an insured or additional insured;

2. be written on a Builder's Risk "all-risk" or open peril or special causes of loss policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, falsework and materials and equipment in transit, and shall insure against at least the following perils or causes of loss: fire, lightning, extended coverage, theft, vandalism and malicious mischief, earthquake, tornado, collapse, debris removal, demolition occasioned by enforcement of Laws or Regulations, water damage, damage caused by frost and freezing, and acts of God;

3. be maintained in effect until final payment is made unless otherwise agreed to in writing by CITY with thirty (30) days written notice to each other additional insured to whom a certificate of insurance has been issued.

B. CITY shall not be responsible for purchasing and maintaining any property insurance to protect the interests of CONTRACTOR, Subcontractors or others involved in the Work to the extent of any deductible amounts. The risk of loss within the deductible amounts will be borne by CONTRACTOR, Subcontractor or others suffering any such loss and if any of them wishes property insurance coverage within the limits of such amounts, each may purchase and maintain it at the purchaser's own expense.

5.07 Waiver of Rights

A. CITY and CONTRACTOR intend that all policies purchased in accordance with Paragraphs 5.04 and 5.06 will protect CITY, CONTRACTOR, DESIGN PROFESSIONAL Consultants, Subcontractors, and all other persons or entities identified in the Supplementary Conditions to be listed as insureds or additional insureds in such policies and will provide primary coverage for all losses and damages caused by the perils covered thereby. All such policies shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any of the insureds or additional insureds thereunder. CITY and CONTRACTOR waive all rights against each other and their respective officers, directors, partners, employees and agents for all losses and damages caused by, arising out of or resulting from any of the perils covered by such policies and any other property insurance applicable to the Work, but only to the extent of insurance coverage; and, in addition, waive all such rights against DESIGN PROFESSIONAL, Consultants, Subcontractors, and all other persons or entities identified in the Supplementary Conditions to be listed as insureds or additional insureds (and the officers, directors, partners, employees, agents, and other consultants and subcontractors of any and each of them) under such policies for losses and damages so caused and covered by insurance. None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by CITY as trustee or otherwise payable under any policy so issued. None of the above waivers shall apply if specifically in conflict with Laws and Regulations.

5.08 Receipt and Application of Insurance Proceeds

A. Any insured loss under the property insurance will be adjusted with CITY and made payable to CITY as fiduciary for the insureds, as their interests may appear, subject to the requirements of any indentures of indebtedness entered into by CITY.

B. CITY as fiduciary shall have power to adjust and settle any loss with the insurers unless one of the parties in interest shall object to CITY's exercise of this power in writing within fifteen (15) days after the occurrence of loss. If such objection is made, CITY as fiduciary shall make settlement with the insurers in accordance with such agreement as the parties in interest may reach. If no such agreement among the parties in interest is reached, CITY as fiduciary shall adjust and settle the loss with the insurers.

5.09 Partial Utilization – Property Insurance

A. If CITY finds it necessary to occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work, such use or occupancy may be accomplished in accordance with Paragraph 14.05; provided that no such use or occupancy shall commence before the insurers providing the property insurance have acknowledged notice thereof and in writing effected any changes in coverage necessitated thereby. The insurers providing the property insurance shall consent by endorsement on the policy or policies, but the property insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy.

ARTICLE 6 CONTRACTOR'S RESPONSIBILITIES

6.01 Indemnification

A. For purposes of this Paragraph 6.01 only, the following terms shall have the meanings listed:

1. Claims means all claims, damages, liability, losses, costs and expenses, including court costs and reasonable attorneys'" fees, including attorney's fees incurred by the City in the enforcement of this indemnity obligation.

2. CONTRACTOR'S Agents means CONTRACTOR's officers, employees, sub-consultants, subcontractors, successors, assigns, invitees, and other agents.

3. CITY means CITY, its Program Manager/Construction Advisor and any of their agents, officials, officers, employees and program managers or construction advisors.

B. CONTRACTOR's obligations under this Paragraph with respect to indemnification for acts or omissions, including negligence, of CITY, shall be limited to the coverage and limits of insurance that CONTRACTOR is required to procure and maintain under this Contract. CONTRACTOR affirms that it has had the opportunity to recover the costs of the liability insurance required in this Contract in its contract price.

C. CONTRACTOR shall defend, indemnify and hold harmless CITY from and against all Claims arising out of or resulting from all acts or omissions in connection with this Contract caused in whole or in part by CONTRACTOR or CONTRACTOR's Agents, regardless of whether or not caused in part by any act or omission, including negligence, of OWNER.

D. In any and all Claims against CITY, DESIGN PROFESSIONAL, CONSULTANT, or any of their respective 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 6.01 C 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.

E. The indemnification obligations of CONTRACTOR under Paragraph 6.01 C shall not extend to liability arising out of, resulting from, or caused by the professional negligence, errors or omissions of DESIGN PROFESSIONAL, CONSULTANT, or any of their respective agents, officers, directors or employees.

6.02 Supervision and Superintendence

A. 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.

B. At all times during the progress of the Work, CONTRACTOR shall assign a competent resident superintendent of the Work, who shall not be replaced without written request to and approval by CITY 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 given to or received from the superintendent shall be binding on CONTRACTOR.

C. If it is determined to be in the best interest of the Work, CONTRACTOR shall replace the project manager, resident superintendent or any other employee of the CONTRACTOR, Subcontractors, Suppliers or other persons or organizations performing or furnishing any of the Work on the project upon written request by the CITY.

6.03 Services, Working Hours, Labor, Materials and Equipment

A. CONTRACTOR shall provide competent, suitably qualified personnel to survey, lay out and construct or perform 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. CONTRACTOR shall not permit overtime work or the performance of Work on Saturday, Sunday or any legal holiday without CITY's written consent given after prior written notice to DESIGN PROFESSIONAL.

B. Unless otherwise specified in Division 1, General Requirements, CONTRACTOR shall furnish and assume full responsibility for all services, 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.

C. 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 CITY. If required by DESIGN PROFESSIONAL, CONTRACTOR shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment. All materials and equipment shall be stored, applied, installed, connected, erected, used, cleaned and conditioned in accordance with instructions of the applicable Supplier, except as otherwise provided in the Contract Documents.

D. It is the policy of the CITY that any manufactured goods or commodities used or supplied in the performance of this Contract and any subcontract hereto shall be manufactured or produced in the United States whenever possible.

6.04 Progress Schedule

A. CONTRACTOR shall adhere to the progress schedule established in accordance with Article 2 as it may be adjusted from time to time as provided below:

1. CONTRACTOR shall provide, at least once every thirty (30) calendar days, updated information on the project schedule, including thirty (30) day look ahead schedules, projected variances per event category and per Subcontractor, identification of all variances and calculation of the number of Days difference between the as-built critical path and the project schedule critical path

2. CONTRACTOR shall, with each application for payment, provide completed monthly updated status report for the previous month on the project schedule and updated information indicating as-built and as-planned conditions. The updated information on the project schedule shall not modify any Milestone dates in the project schedule that CITY has previously approved. The updated information required is a condition precedent to payment pursuant to paragraph 14.02 and shall include at a minimum:

a. a concise statement of the outlook for meeting project schedule dates and the reasons for any change in outlook from the previous report;

b. a review of any significant technical problems encountered during the month;

c. an explanation of any corrective action taken or proposed; and

d. a summary of any Claims anticipated by CONTRACTOR with respect to the Work, including the anticipated costs and schedule impacts of any such Claims.

6.05 Recovery Schedules

A. If the CONTRACTOR should:

1. fail, refuse or neglect to supply a sufficient number of workers or to deliver the materials or equipment with such promptness as to prevent the delay in the progress of the Work;

2. fail in any respect to commence and diligently prosecute the Work in accordance with the approved baseline project schedule in order to achieve substantial completion;

3. fail to commence, prosecute, finish, deliver or install the different portions of the Work on time as specified in the approved baseline project schedule; or

4. fail in the performance of any of the material covenants of the Contract Documents;

CITY shall have the right to direct the CONTRACTOR, upon seven (7) calendar days notice, to prepare a written recovery plan, for CITY's approval, to accelerate the Work in order to conform to the approved baseline project schedule, including, without limitation, providing additional labor or expediting delivery of materials, performing overtime or re-sequencing the Work without adjustments to the Contract value. Upon CITY's approval of the recovery plan, CONTRACTOR shall accelerate the Work in accordance with the plan.

B. Proposed recovery schedules shall be submitted to the CITY as a separate project plan for review and approval by CITY prior to incorporation into the approved baseline schedule. The recovery schedule shall be submitted in a format compatible with the baseline schedule format. Each proposed revision shall be submitted as a separate schedule, with the following minimum requirements:

1. A critical path method diagram showing revised and affected activities or Milestones.

2. An activity report for all revised and affected activities or Milestones.

C. Upon acceptance of the recovery schedule by CITY, data shall be added or revised for all new or revised activities and incorporated into the approved baseline project schedule.

6.06 Substitutes and "Or-Equal" Items

A. Materials or equipment: 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, appearance 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 or material or equipment of other Suppliers may be submitted to CITY for review by CITY's Representative under the following circumstances:

1. "Or-Equal": If, prior to receipt of Bids, Bidder proposes an item of material or equipment as functionally equal to that named and sufficiently similar so that no change in related Work will be required, CITY's Representative may request DESIGN PROFESSIONAL to consider it as an "or-equal" item. DESIGN PROFESSIONAL will review and recommend the acceptance, or rejection, of the proposed item to the CITY's Representative. For the purposes of this Paragraph, a proposed item of material or equipment will be considered functionally equal to an item so named if:

a. in the exercise of reasonable judgment DESIGN PROFESSIONAL determines that:

(1) it is at least equal in quality, durability, appearance, strength, and design characteristics; and

(2) it will reliably perform at least equally well the function imposed by the design concept of the completed Project as a functioning whole; and

b. Bidder certifies that:

(1) there is no increase in cost to the CITY; and

(2) it will conform substantially, even with deviations, to the detailed requirements of the item named in the Contract Documents.

If the CITY's Representative approves the proposed item, it may be accepted by CITY.

2. Substitute Items: If CONTRACTOR proposes an item of material or equipment as a substitute item, then CONTRACTOR shall submit sufficient information as provided below to allow CITY's Representative to determine that the item of material or equipment proposed is essentially equivalent to that named and an acceptable substitute therefore. The procedure for review by the CITY's Representative will include the following as supplemented in the General Requirements and as CITY's Representative may determine is appropriate under the circumstances:

a. Requests for review of proposed substitute items of material or equipment will not be accepted by CITY's Representative from anyone other than CONTRACTOR.

b. If CONTRACTOR wishes to furnish or use a substitute item of material or equipment, CONTRACTOR shall first make written application to CITY's Representative for acceptance thereof.

c. In the application, CONTRACTOR shall certify 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 impact CONTRACTOR's achievement of Substantial Completion, 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 CITY for work on the Project) to adapt the design to the proposed substitute and whether or not incorporation or use of the substitute in connection with the Work is subject to payment of any license fee or royalty.

d. 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 CITY's Representative in evaluating the proposed substitute. CITY's Representative may require CONTRACTOR to furnish additional data about the proposed substitute.

If the CITY's Representative approves the proposed item, CITY may accept it.

B. 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 DESIGN PROFESSIONAL. CONTRACTOR shall notify CITY and submit sufficient information to allow DESIGN PROFESSIONAL, in DESIGN PROFESSIONAL's sole discretion, to determine that the substitute proposed is equivalent to that expressly called for by the Contract Documents.

C. Expenses: Bidder shall provide all data in support of any "or equal" at Bidder's expense, and CONTRACTOR shall provide all data in support of any proposed substitute at CONTRACTOR's expense.

D. Evaluation: DESIGN PROFESSIONAL and CITY's Representative will be allowed a reasonable time within which to evaluate each proposal or submittal made pursuant to Paragraphs 6.06 A, and 6.06 B. CITY will be the sole judge of acceptability. No "or-equal" or substitute will be ordered, installed or utilized without CITY's prior written acceptance which will be evidenced by either a Change Order or an approved Shop Drawing. CITY may require CONTRACTOR to furnish at CONTRACTOR's expense, a special performance guarantee or other surety with respect to any "or-equal' substitute. DESIGN PROFESSIONAL will record time required by DESIGN PROFESSIONAL and Consultants in evaluating substitutes proposed or submitted by CONTRACTOR pursuant to Paragraphs 6.06 A and 6.06 B and in making changes in the Contract Documents (or in the provisions of any other direct contract with CITY for work on the Project) occasioned thereby. Whether or not CITY accepts a substitute so proposed or submitted by CONTRACTOR, CONTRACTOR shall reimburse CITY for the reasonable charges of DESIGN PROFESSIONAL and Consultants for evaluating each such proposed substitute.

6.07 Concerning Subcontractors, Suppliers and Others

A. CONTRACTOR shall not employ or retain any Subcontractor, Supplier or other person or organization (including those acceptable to CITY as indicated in Paragraph 6.07 B), whether initially or as a substitute, against whom CITY has a reasonable objection, including but not limited to debarment by City or another governmental entity or decertification of the Subcontractor from the City's Minority and Women's Business Enterprise Program as a result of the Subcontractor's failure to comply with any of the requirements of the provisions of Chapter 3 of the City's Code as determined by the Director of the Civil Rights and Equal Opportunity Department. Contractor shall insert this provision in any subcontractor agreement associated with this Contract. 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. CONTRACTOR shall submit required information for all Subcontractors on Form 01290.09 - Subcontractor and Major Material Suppliers List, provided in these Contract Documents, prior to Subcontractor beginning Work at the Site.

B. The Supplementary Conditions 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 CITY on or before the date specified in the Supplementary Conditions, for acceptance by CITY. If CONTRACTOR has submitted a list

thereof in accordance with the Supplementary Conditions, CITY may accept (either in writing or by failing to make written objection thereto by the date indicated for acceptance or objection in the Contract Documents) any such Subcontractor, Supplier or other person or organization so identified, or may reject same on the basis of reasonable objection after due investigation, in which case CONTRACTOR shall submit an acceptable replacement for the rejected Subcontractor, Supplier or other person or organization. The Contract Price will be adjusted by the difference in the cost occasioned by such substitution, and an appropriate Change Order will be issued or Written Amendment signed. No acceptance by CITY of any such Subcontractor, Supplier or other person or organization shall constitute a waiver of any right of CITY or DESIGN PROFESSIONAL to reject defective Work.

C. CONTRACTOR shall be fully responsible to CITY for all acts and omissions of the Subcontractors, Suppliers and other persons and organizations performing or furnishing any of the Work under a direct or indirect contract with CONTRACTOR just as CONTRACTOR is responsible for CONTRACTOR's own acts and omissions. Nothing in the Contract Documents shall create for the benefit of any such Subcontractor, Supplier or other person or organization any contractual relationship between CITY or DESIGN PROFESSIONAL and any such Subcontractor, Supplier or other person or organization, nor shall it create any obligation on the part of CITY or DESIGN PROFESSIONAL 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 or Regulations.

D. 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.

E. CONTRACTOR shall contractually require all Subcontractors, Suppliers and such other persons and organizations performing or furnishing any of the Work to communicate with CITY and DESIGN PROFESSIONAL through CONTRACTOR.

F. 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.

G. All Work performed for CONTRACTOR by a Subcontractor or Supplier shall be pursuant to an appropriate written agreement between CONTRACTOR and the Subcontractor or Supplier that specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of CITY. Whenever any such agreement is with a Subcontractor or Supplier who is listed as an additional insured on the property insurance provided in Paragraph 5.06, the agreement between the CONTRACTOR and the Subcontractor or Supplier will contain provisions whereby the Subcontractor or Supplier waives all rights against CITY, CONTRACTOR, DESIGN PROFESSIONAL, Consultants and all other additional insureds for all losses and damages caused by, arising out of or resulting from any perils, to the extent covered by such policies and any other property insurance applicable to the Work. If the insurers on any such policies require separate waiver forms to be signed by any Subcontractor or Supplier, CONTRACTOR will obtain the same.

H. Except as otherwise provided in this subsection H and in accordance with the provisions of subsection C hereof, the agreement between CONTRACTOR and the Subcontractor or Supplier referred to in subsection G, shall provide that the CONTRACTOR and the Subcontractor or Supplier agree not to request CITY or CITY's Representative to intervene in or facilitate the resolution of claims or contract disputes arising out of or related to the agreement between CONTRACTOR and the Subcontractor or Supplier. Furthermore, the Contracts between CONTRACTOR and Subcontractors or Suppliers shall provide that all unresolved claims and disputes between CONTRACTOR and the Subcontractor or Supplier that remain unresolved after thirty (30) calendar days from the notice of claim, shall be subject to mediation as a condition precedent to the institution of legal proceedings by either party. Any such mediation shall be conducted in accordance with the CITY's Code Section 3-467.

I. CONTRACTOR shall not insert any provision in any subcontractor agreement associated with this Contract that explicitly states or implies that the subcontractor shall only be paid for work performed if or when the general CONTRACTOR is paid by the CITY . Contractor's compliance with this provision is a material term of this Contract.

J. CONTRACTORS shall not deny any Subcontractor subcontracting opportunities solely because the Subcontractor is not a signatory to collective bargaining agreements with organized labor.

6.08 Patent Fees and Royalties

A. 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 into 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 CITY or DESIGN PROFESSIONAL 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 CITY in the Contract Documents. To the fullest extent permitted by Laws or Regulations, CONTRACTOR shall defend, indemnify and hold harmless CITY, DESIGN PROFESSIONAL, 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 (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) 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 into the Work of any invention, design, process, product or device not specified in the Contract Documents.

6.09 Permits

A. Unless otherwise provided in the Supplementary Conditions, CONTRACTOR shall obtain and pay for all construction permits and licenses. CITY 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 Contract. CONTRACTOR shall pay all charges of utility owners for connections to the Work.

B. CONTRACTOR, at its own expense, shall comply with all Federal, State and local laws and regulations, including, but not limited to the Missouri Clean Water Law (Chapter 644 RSMo) together with any accompanying regulation(s) contained in the Missouri Code of State Regulations (CSR Title 10), as well as any implementing permits, together with any CITY Provisions during the life of this Contract including but not limited to:

1. Approvals and permits as required for construction or land disturbance activities.

2. Compliance with the State of Missouri – Department of Natural Resources ("MDNR") Missouri State Operating Permit ("Land Disturbance Permit"), MO-R100006 for all construction or land disturbance activity.

3. Development and implementation of a Storm Water Pollution Prevention Plan (SWPPP).

(a) Contractor shall not commence land disturbance activity until the initial SWPPP has been finalized.

(b) Preparation and submittal of all applications, documentation and exhibits required to obtain MDNR approvals for uninterrupted Work at the Site.

(c) Amending/Updating SWPPP.

(d) Site Inspections and submittal of Inspection Reports

(e) Proper Operation and Maintenance to achieve compliance with the terms of the Permit.

(f) Maintenance of required records in accordance with MDNR requirements and requirements included in Article 6 of these Contract Documents.

4. In addition to requirements of Article 6, Contractor shall also provide record access to Missouri Department of Natural Resources (MDNR).

5. Failure to control erosion and water pollution is a permit violation. CONTRACTOR shall have 24 hours after receiving notice of the violation to correct the problem. If the CONTRACTOR fails to correct the problem after the time prescribed, the City will hire a remediation expert to fix the problem. In such an event, the CONTRACTOR shall be liable to the City for the remediation costs plus a 10% mark-up of the total contract price. If the CONTRACTOR receives three (3) notices of violation of the erosion control plan and the City's MS4 permit, the Director may issue a stop work order and delay any payment until control measures are properly functioning and stream damage has been mitigated. In such an event, any delay to the project schedule will result in liquidated damages assessed against the CONTRACTOR.

6.10 Compliance with Laws and Regulations

A. CONTRACTOR shall comply with all federal, state and local laws, ordinances and regulations applicable to the work and this Contract. CONTRACTOR shall give all notices and comply with all Laws or Regulations applicable to furnishing and performing the Work. Except where otherwise expressly required by applicable Laws or Regulations, neither CITY nor DESIGN PROFESSIONAL shall be responsible for monitoring CONTRACTOR's compliance with any Laws or Regulations. The Laws or Regulations included in this Paragraph shall include, but not be limited to, those set forth in the Supplementary Conditions.

B. **Failure to Comply**. If CONTRACTOR performs any Work in violation of applicable Laws or Regulations, CONTRACTOR shall bear all claims, costs, losses and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) 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 or Regulations, but this shall not relieve CONTRACTOR of CONTRACTOR's obligations under Paragraph 3.03.

C. **Conflicts of Interest**. The provisions of City's Code Sections 2-2001 and 3-301, prohibiting City officers and employees from having a financial or personal interest in any contract with City, and Code Sections 3-307, and 3-309, imposing sanctions for violations, shall apply to this Contract. CONTRACTOR certifies that no officer or employee of City has, or will have, a direct or indirect financial or personal interest in this Contract, and that no officer or employee of City, or member of such officer's or employee's immediate family, either has negotiated, or has or will have an arrangement concerning employment to perform services on behalf of CONTRACTOR on this Contract.

D. **Licenses and Permits**. CONTRACTOR, at its own expense, shall secure or cause to be secured all licenses and permits from public or private sources necessary for the fulfillment of its obligations under this Contract. All references in this Contract to the "Code" shall mean City's Code of Ordinances, including any amendments thereto or re-codification thereof unless the context clearly indicates otherwise. CONTRACTOR shall obtain copies of all necessary licenses and permits from Subcontractors required for the Work before Subcontractors begin Work at the Site. CONTRACTOR shall retain such evidence in its files and make available to CITY within ten (10) days after CITY's written request.

E. Americans with Disabilities Act. CONTRACTOR agrees to comply, during the course of this Contract, with all provisions of Title II of the 2010 ADA Standards for Accessible Design as amended from time to time.

F. Affirmative Action. If the Contract Price exceeds $300,000.00 and CONTRACTOR employs fifty (50) or more people, CONTRACTOR shall comply with City's Affirmative Action requirements in accordance with the provisions of Chapter 3 of City's Code, the rules and regulations relating to those sections, and any additions or amendments thereto. CONTRACTOR shall not discriminate against any employee or applicant for employment because of race, color, sex, religion, national origin or ancestry, disability, sexual orientation, gender identity or age in a manner prohibited by Chapter 3 of City's Code.

CONTRACTOR shall:

1. Submit, in print or electronic format, a copy of CONTRACTOR'S current certificate of compliance to the City's Civil Rights and Equal Opportunity Department (CREO) prior to receiving the first payment under the contract, unless a copy has already been submitted to CREO at any point within the previous two calendar years. If, and only if, CONTRACTOR does not possess a current certification of compliance, CONTRACTOR shall submit, in print or electronic format, a copy of its affirmative action program to CREO prior to receiving the first payment under the contract, unless a copy has already been submitted to CREO at any point within the previous two calendar years.

2. Require any Subcontractor awarded a subcontract exceeding $300,000.00 to affirm that Subcontractor has an affirmative action program in place and will maintain the affirmative action program in place for the duration of the subcontract.

3. Obtain from any Subcontractor awarded a subcontract exceeding $300,000.00 a copy of the Subcontractor's current certificate of compliance and tender a copy of the same, in print or electronic format, to CREO within thirty (30) days from the date the subcontract is executed. If, and only if, Subcontractor does not possess a current certificate of compliance, CONTRACTOR shall obtain a copy of the Subcontractor's affirmative action program and tender a copy of the same, in print or electronic format, to CREO within thirty (30) days from the date the subcontract is executed.

City has the right to take action as directed by City's Civil Rights and Equal Opportunity Department to enforce this provision. If CONTRACTOR fails, refuses or neglects to comply with the provisions of Chapter 3 of City's Code, then such failure shall be deemed a total breach of this Contract and this Contract may be terminated, canceled or suspended, in whole or in part, and CONTRACTOR may be declared ineligible for any further contracts funded by City for a period of one (1) year. This is a material term of this Contract.

G. **Minority and Women Business Enterprises and Workforce**. City is committed to ensuring that minorities and women participate to the maximum extent possible in the performance of City's construction contracts. If minority and women business enterprise (M/WBE) goals have been set for this Contract, CONTRACTOR agrees to comply with all requirements of City's Minority and Women's Business Enterprise Program as enacted in City's Code, Sections 3-421 through 3-469 and as hereinafter amended. CONTRACTOR shall meet or exceed both the MBE and WBE goals set forth in its Contractor Utilization Plan/Request for Waiver. If workforce utilization goals are applicable to this Contract, CONTRACTOR agrees to comply with all requirements of City's Construction Employment Program as enacted in City's Code, Sections 3-501 through 3-527 and as hereinafter amended. CONTRACTOR shall meet or exceed the construction employment goals unless the same shall have been waived in the manner provided by law. CONTRACTOR's compliance with this provision is a material part of this Contract.

H. **Records.**

1. For purposes of this section:

(a) "City" shall mean the City Auditor, the City's Internal Auditor, the City's Director of Civil Rights and Equal Opportunity, the City Manager, the City department administering this Contract and their delegates and agents.

(b) “Record” shall mean any document, book, paper, photograph, map, sound recordings or other material, regardless of physical form or characteristics, made or received in connection with this Contract and all Contract amendments and renewals.

2. CONTRACTOR shall maintain and retain all Records for a term of five (5) years that shall begin after the expiration or termination of this Contract and all Contract amendments. City shall have a right to examine or audit all Records and CONTRACTOR shall provide access to City of all records upon ten (10) days written notice from the City.

I. Prevailing Wage.

1. CONTRACTOR shall comply and require its Subcontractors to comply with;

a. sections 290.210 to 290.340, RSMO the State of Missouri Prevailing Wage Law (the “Law”); and

b. 8 CSR 30-3.010 to 8 CSR 30-3.060, the Prevailing Wage Law Rules (the “Rules”); and

c. the Annual Wage Order (Wage Order) issued by the State of Missouri’s Department of Labor and Industrial Relations; and

d. any applicable Annual Incremental Wage Increase (Wage Increase) to the Annual Wage Order.

2. The Law, Rules, Annual Wage Order and any Wage Increase are incorporated into and made part hereof this Contract and shall be collectively referred to in this Section as the “Prevailing Wage Requirements.”

3. CONTRACTOR shall pay and require its Subcontractors to pay to all workers performing work under this Contract not less than the prevailing hourly rate of wages for the class or type of work performed by the worker in accordance with the Law, Rules, Wage Order and any applicable Wage Increase. CONTRACTOR shall take whatever steps are necessary to insure that the prevailing hourly wage rates are paid and that all workers for CONTRACTOR and each of its Subcontractors are paid for the class or type of work performed by the worker in accordance with the Prevailing Wage Requirements. If CONTRACTOR shall fail to start to perform CONTRACTOR’s obligations under the Contract Documents within sixty (60) days from the Effective Date of the Contract, CONTRACTOR and each of its subcontractors shall be obligated to pay all workers in accordance with any new Wage Order, as subsequently amended by any applicable Wage Increase, issued by the Department of Labor and Industrial Relations within the aforementioned sixty (60) day period. The new Wage Order and any applicable Wage Increase shall govern notwithstanding the fact that the Wage Order being replaced might be physically attached or incorporated in the Contract Documents.

4. Prior to each of its Subcontractors beginning Work on the Site, CONTRACTOR shall require each Subcontractor to complete CITY’s Form 00490 entitled “Pre-contract Certification” that sets forth the Subcontractor’s prevailing wage and tax compliance history for the two (2) years prior to the bid. CONTRACTOR shall retain one (1) year and make the Pre-contract Certifications available to CITY within five (5) days after written request.

5. CONTRACTOR shall:

a. Keep and require each of its Subcontractors engaged in the construction of public works in performance of the Contract to keep full and accurate records on City’s “Daily Labor Force Report” Form indicating the worker’s name, occupational title or classification group & skill and the workers’ hours. City shall furnish blank copies of the Daily Labor Force Report Form to Contractor for its use and for distribution to Subcontractors. Contractor shall submit its and its Subcontractors Daily Labor Force Reports to City each day; and

b. Submit, and require each of its Subcontractors engaged in the construction of public works in performance of the Contract to submit electronically, in a format prescribed by the City, Certified Payroll Report Information indicating the worker's name, address, social security number, occupation(s), craft(s) of every worker employed in connection with the public work together with the number of hours worked by each worker and the actual wages paid in connection with the Project and other pertinent information as requested by the City; and

c. Submit, and require each of its Subcontractors engaged in the construction of public works in performance of the Contract to submit, electronically, in format prescribed by the City, a Payroll Certification. The Payroll Certification must be signed by the employee or agent who pays or supervises the payment of the workers employed under the Contract for the Contractor and each Subcontractor; and

d. The Daily Labor Force Report, documents used to compile information for the Certified Payroll Report, and Payroll Certification are collectively referred to in this Section as the "Records."

6. CONTRACTOR shall submit its and its Subcontractors Daily Labor Force Reports to CITY each day. CONTRACTOR shall make all of CONTRACTOR's and Subcontractors' Records open to inspection by any authorized representatives of OWNER and the Missouri Department of Labor and Industrial Relations at any reasonable time and as often as they may be necessary and such Records shall not be destroyed or removed from the State of Missouri for a period of one (1) year following the completion of the public work in connection with which the Records are made. CONTRACTOR shall have its and its Subcontractors Certified Payroll Reports and Payroll Certifications available at the CONTRACTOR's office and shall provide the Records to the City electronically at City's sole discretion. In addition, all Records shall be considered a public record and CONTRACTOR shall provide the Records to the CITY in the format required by the CITY within three (3) working days of any request by CITY at the CONTRACTOR's cost. CITY, in its sole discretion, may require CONTRACTOR to send any of the Records directly to the person who requested the Record at CONTRACTOR's expense.

7. CONTRACTOR shall post and keep posted a clearly legible statement of all prevailing hourly wage rates to be paid to all workers employed by CONTRACTOR and each of its Subcontractors in the performance of this Contract in a prominent and easily accessible place at the Site of the Work by all workers.

8. If the Contract Price exceeds $250,000.00, CONTRACTOR shall and shall require each Subcontractor engaged in any construction of public works to have its name, acceptable abbreviation or recognizable logo and the name of the city and state of the mailing address of the principal office of the company, on each motor vehicle and motorized self-propelled piece of equipment which is used in connection with the Project during the time the CONTRACTOR or Subcontractor is engaged on the project. The sign shall be legible from a distance of twenty (20') feet, but the size of the lettering need not be larger than two (2") inches. In cases where equipment is leased or where affixing a legible sign to the equipment is impractical, the CONTRACTOR may place a temporary stationary sign, with the information required pursuant to this section, at the main entrance of the Project in place of affixing the required information on the equipment so long as such sign is not in violation of any state or federal statute, rule or regulation. Motor vehicles which are required to have similar information affixed thereto pursuant to requirements of a regulatory agency of the state or federal government are exempt from the provisions of this subsection.

9. CONTRACTOR must correct any errors in CONTRACTOR's or any Subcontractors' Records, or CONTRACTOR's or any Subcontractors' violations of the Law, Rules, Annual Wage Order and any Wage Increase within fourteen (14) calendar days after notice from CITY.

10. CONTRACTOR shall and shall require its Subcontractors to cooperate with the CITY and the Department of Labor and Industrial Relations in the enforcement of this Section, the Law, Rules, Annual Wage Order and any Wage Increase. Contractor shall and shall require its Subcontractors to permit CITY and the Department of Labor and Industrial Relations to interview any and all workers during working hours on the Project at CONTRACTOR's sole cost and expense.

11. CONTRACTOR shall file with CITY, upon completion of the Project and prior to final payment therefore, affidavits from CONTRACTOR and each of its Subcontractors, stating that each has fully complied with the provisions and requirements of the Missouri Prevailing Wage Law. CITY shall not make final payment until the affidavits, in proper form and order, from CONTRACTOR and each of its Subcontractors, are filed by CONTRACTOR.

12. CONTRACTOR shall forfeit as a statutory penalty to the CITY one hundred dollars ($100.00) for each worker employed, for each calendar day, or portion thereof, such worker is paid less than the prevailing hourly rates for any work done under this Contract, by CONTRACTOR or by any of CONTRACTOR's Subcontractors. If CONTRACTOR or any of its Subcontractors have violated any section(s) of 290.210 to 290.340, RSMo, in the course of the execution of the Contract, CITY shall when making payments to the CONTRACTOR becoming due under this Contract, withhold and retain therefrom all sums and amounts due and owing as a result of any violation of sections 290.210 to 290.340, RSMo.

J. **Prevailing Wage Damages**. CONTRACTOR acknowledges and agrees that, based on the experience of CITY, violations of the Missouri Prevailing Wage Act, whether by CONTRACTOR or its Subcontractors, commonly result in additional costs to CITY. CONTRACTOR agrees that additional costs to CITY for any particular violation are difficult to establish and include but are not limited to: costs of construction delays, additional work for CITY, additional interest expenses, investigations, and the cost of establishing and maintaining a special division working under the City Manager to monitor prevailing wage compliance.

1. In the event of the failure by CONTRACTOR or any of its Subcontractors to pay wages as provided in the Missouri Prevailing Wage Act, CITY shall be entitled to deduct from the Contract Price, and shall retain as liquidated damages, one hundred dollars ($100.00) per day, per worker who is paid less than the prevailing hourly rate of wages, to approximate the additional costs. The sum shall be deducted, paid or owed whether or not the Contract Times have expired.

2. CITY shall give written notice to CONTRACTOR setting forth the workers, who have been underpaid, the amount of the statutory penalty and the amount of the liquidated damages as provided for in this Subparagraph J**.** CONTRACTOR shall have fourteen (14) calendar days to respond, which time may be extended by CITY upon written request. If CONTRACTOR fails to respond within the specified time, the CITY's original notice shall be deemed final. If CONTRACTOR responds to CITY's notice, CITY will furnish CONTRACTOR a final decision in writing within five (5) days of completing any investigation.

K. **Missouri Secretary of State Business Entity Registration**. CONTRACTOR shall obtain from all Subcontractors for the Project, a copy of their current certificate of good standing or fictitious name registration from the Missouri Secretary of State before they begin work on the Site. CONTRACTOR shall retain such documents in its files and make available to CITY within ten (10) days after written request.

L. **Tropical Hardwoods**. The provisions of Code Section 2-1872, restricting the use of tropical hardwoods, shall apply to this Contract.

M. **Preference for Missouri Products**. Pursuant to Section 71.140 RSMo., preference shall be given to materials, products, supplies and all other articles produced, manufactured, made or grown within the State of Missouri.

N. **Guidelines for Open Excavations**.

1. CONTRACTOR shall restore required excavations to the level of the adjacent surfaces as soon as practicable. Unsupervised open excavations on public properties are discouraged at all times. If CONTRACTOR, in performance of the Work, makes or causes to be made any excavation in, upon, under, through or adjoining any street, sidewalk, alley, park, boulevard, parkway or any other public properties, and shall leave any part or portion thereof open, CONTRACTOR shall provide effective protection to the public.

2. CONTRACTOR shall protect and secure all excavations in roadways in compliance with existing federal, state and local codes and standards, including, but not limited to the most current edition of the Manual of Uniform Traffic Control Devices. CONTRACTOR shall protect and secure all unsupervised excavations not within roadways, either by covering or fencing.

a. Covering. A protective cover that can sustain the weight of persons or of objects that are placed upon it may be installed over an unsupervised excavation. The cover shall be secured to the ground to prevent movement. Protective covers shall have no opening(s) or protuberance(s) of sufficient size to cause a fall and/or injury. Advance warning devices shall be installed as necessary.

b. Fencing. Fencing to prevent entry may be installed surrounding an unsupervised excavation not protectively covered in its entirety. The fencing shall be a minimum of 42” in height. The fencing shall be constructed in such a manner that it is adequately secured and will remain upright at all times under normal Site conditions. All protective coverings and fences over and around excavations shall be inspected at least daily to assure integrity. Protective coverings and/or fences in heavily trafficked areas shall be inspected more often as necessary.

O. **Notification of Utilities**. CONTRACTOR shall adhere to the provisions of Sections 319.010 et seq., RSMo., which requires that a person or firm making an excavation in any public street, road or alley, right of way dedicated to public use, utility easement of record, or within any private street or private property do so only after giving notice to, and obtaining information from, owners of Underground Facilities. The 24-hour, toll-free accident prevention hotline number in Missouri is 1-800-344-7483 (1-800-Digrite).

P. Employee Eligibility Verification. CONTRACTOR shall adhere to the provisions of Sections 285.525 et seq., RSMo., which requires that for any contract exceeding five thousand dollars ($5,000.00), CONTRACTOR shall execute and submit an affidavit, in a form prescribed by CITY, affirming that CONTRACTOR does not knowingly employ any person in connection with the contracted services who does not have the legal right or authorization under federal law to work in the United States as defined in 8 U.S.C.§ 1324a(h)(3). CONTRACTOR shall attach to the affidavit documentation sufficient to establish CONTRACTOR’S enrollment and participation in an electronic verification of work program operated by the United States Department of Homeland Security (E-Verify) or an equivalent federal work authorization program operated by the United States Department of Homeland Security to verify information of newly hired employees, under the Immigration Reform and Control Act of 1986. CONTRACTOR may obtain additional information about E-Verify and enroll at https://e-verify.uscis.gov/enroll/StartPage.aspx?JS=YES. For those Contractors enrolled in E-Verify, the first and last pages of the E-Verify Memorandum of Understanding that CONTRACTOR will obtain upon successfully enrolling in the program shall constitute sufficient documentation for purposes of complying with this Section. CONTRACTOR shall submit the affidavit and attachments to CITY prior to execution of the Contract, or at any point during the term of the Contract if requested by City.

Q. **OSHA 10-Hour Training Requirement**. CONTRACTOR and any subcontractor working under this Contract shall require every employee on the Site to complete a ten-hour construction safety program which meets the requirements of Section 292.675, RSMo, except for those employees who shall have previously completed the required program and hold documentation to that effect. CONTRACTOR shall remove or require the removal of any

person from the Site who is subject to this requirement and who does not complete or is unable to produce documentation of their successful completion of the required program within the time limitations prescribed by Section 292.675, RSMo. CONTRACTOR shall forfeit the sum of two thousand five hundred dollars ($2,500.00), in addition to one hundred dollars ($100.00) per employee each calendar day, or portion thereof, the employee(s) shall continue to be employed without having completed the required program within the time limitations prescribed by Section 292.675, RSMo. CITY shall be entitled to withhold and retain any amounts due and owing hereunder when making payment to CONTRACTOR.

R. Clean Air Act and Clean Water Act. CONTRACTOR shall comply with requirements of the Clean Air Act (42 U.S.C. 7401 *et seq*.); Clean Water Act (33 U.S.C. 1251 *et seq*.), Missouri Clean Water Law (Chapter 644 RSMo), Code of Federal regulations (Title 40: Protection of Environment, Title 33: Navigation and Navigable Waters) and the rules of the Missouri Code of State Regulations (CSR Title 10).

S. Contract information Management System. If applicable, CONTRACTOR shall comply with CITY's Contract Information Management System requirements. CONTRACTOR shall use CITY's Internet web based Contract Information Management System/Project Management Communications Tool provided by CITY and protocols included in that software during the term of this Contract. CONTRACTOR shall maintain user applications to CITY's provided system for all personnel, subcontractors or suppliers as applicable and shall require subcontractors/subconsultants to maintain same.

T. Anti-Discrimination Against Israel. If this Contract exceeds $100,000.00 and CONTRACTOR employs at least ten employees, pursuant to Section 34.600, RSMo., by executing this Contract, CONTRACTOR certifies it is not currently engaged in and shall not, for the duration of this contract, engage in a boycott of goods or services from the State of Israel; companies doing business in or with Israel or authorized by, licensed by, or organized under the laws of the State of Israel; or persons or entities doing business in the State of Israel.

U. Ban the Box in Hiring and Promotion

a. Pursuant to Section 38-104, City Code Ordinances, CONTRACTOR shall not base a hiring or promotional decision on an applicant's criminal history or sentence related thereto, unless the employer can demonstrate that the employment-related decision was based on all information available including consideration of the frequency, recentness and severity of a criminal record and that the record was reasonably related to the duties and responsibilities of the position.

b. Notwithstanding subsection (a), CONTRACTOR may inquire about an applicant's criminal history after it has been determined that the individual is otherwise qualified for the position, and only after the applicant has been interviewed for the position. Any such inquiry may be made of all applicants who are within the final selection pool of candidates from which a job will be filled.

c. This provision shall not apply to positions where employers are required to exclude applicants with certain criminal convictions from employment due to local, state or federal law or regulation.

V. Title VI of the Civil Rights Act of 1964

a. Title VI of the Civil Rights Act of 1964 requires that no person in the United States shall, on the grounds of race, color, or national or origin (including limited English proficient individuals), be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving federal financial assistance. The City of Kansas City, Missouri requires compliance with the requirements of Title VI in all of its programs and activities regardless of the funding source.

b. CONTRACTOR shall not discriminate on the grounds of race, color, or national or origin (including limited English proficient individuals).

W. Non-discrimination in Employment

CONTRACTOR shall not discriminate against any employee or candidate for employment on the basis of an individual's race, hair texture or hair style associated with an individual's race, color, sex, religion, national origin, or ancestry, disability, sexual orientation, gender identity or age in a manner prohibited by Chapter 38 of the City Code. CONTRACTOR shall not engage in any discrimination as prohibited by Chapter 3 of the City Code.

X. Quality Services Assurance Act

If this Contract exceeds $160,000.00, CONTRACTOR certifies that CONTRACTOR will pay all employees who will work on this Contract in the city limits of Kansas City, Missouri at least $15.00 per hour in compliance with the City's Quality Services Assurance Act, Section 3-66, Code of Ordinances unless City has granted CONTRACTOR an exemption pursuant to the Quality Services Assurance Act.

6.11 Taxes

A. CONTRACTOR shall pay all sales, consumer, use and other similar taxes required to be paid by CONTRACTOR in accordance with the Laws or Regulations of the place of the Project which are applicable during the performance of the Work.

B. **Tax Compliance**.

1. As a condition precedent to CITY making its first payment to CONTRACTOR under this Contract, CONTRACTOR shall furnish to CITY sufficient proof from City's Commissioner of Revenue, dated not more than one (1) year prior to the date provided to CITY, verifying that CONTRACTOR is in compliance with the license and tax ordinances administered by City's Revenue Division of the Finance Department.

2. As a condition precedent to Subcontractors performing any Work under this Contract, CONTRACTOR shall obtain from Subcontractor sufficient proof from City's Commissioner of Revenue, dated not more than one (1) year before the date Subcontractor begins Work, verifying that the Subcontractor is in compliance with the license and tax ordinances administered by City's Revenue Division of the Finance Department. CONTRACTOR shall retain such documentation in its files and make available to CITY within ten (10) days after a written request.

3. As a condition precedent to CITY making final payment under this Contract, if this Contract is longer than one (1) year and exceeds the dollar threshold established by ordinance and included in the Supplementary Conditions, CONTRACTOR shall furnish to CITY sufficient proof from City's Commissioner of Revenue, dated not more than one (1) year before the filing of a final Application for Payment, verifying that CONTRACTOR is in compliance with the license and tax ordinances administered by City's Revenue Division of the Finance Department.

4. If this Contract is longer than one (1) year and exceeds the dollar threshold established by ordinance and included in the Supplementary Conditions, CONTRACTOR shall obtain from Subcontractors sufficient proof from City's Commissioner of Revenue, dated not more than one (1) year before the date of CONTRACTOR's final payment to the Subcontractor, that the Subcontractor was or is in compliance with the license and tax ordinances administered by City's Revenue Division of the Finance Department. CONTRACTOR shall retain such documentation in its files and make available to CITY within ten (10) days after written request.

5. If, at the time of final payment to CONTRACTOR, CONTRACTOR is unable to obtain from all its Subcontractors, if any, and furnish to CITY sufficient proof from City's Commissioner of Revenue that all its Subcontractors are in compliance with the license and tax ordinances administered by City's Revenue Division of the Finance Department, CITY may approve final payment to CONTRACTOR if CITY determines that CONTRACTOR has made a good faith effort to furnish evidence or that there are other extenuating circumstances which make it impossible for CONTRACTOR to furnish sufficient proof.

C. **Missouri Sales Tax Exemption**. Pursuant to Section 144.062, RSMo, CITY is a Missouri exempt entity and tangible personal property to be incorporated or consumed in the construction of this Project may be purchased without sales tax. CITY shall furnish CONTRACTOR a Missouri Project Exemption Certificate for Sales Tax at the time of issuance of the Notice to Proceed.

6.12 Use of Site and Other Areas

A. CONTRACTOR shall confine construction equipment, the storage of materials and equipment, and the operations of workers to the Site and other areas identified in and permitted by the Contract Documents and other areas permitted by Laws or Regulations. CONTRACTOR shall not unreasonably encumber the Site and the other areas with construction equipment or other materials or equipment. CONTRACTOR shall assume full responsibility for any damage to the Site or the other areas, or to the owner or occupant thereof, or of any adjacent land or areas, resulting from the performance of the Work.

B. 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. In case of a failure on the part of the CONTRACTOR to restore such property or to make good such damage or injuries, the CITY may, upon forty-eight (48) hours written notice to the CONTRACTOR, repair, rebuild or otherwise restore such property as the CITY may deem necessary, and the cost thereof will be deducted from any moneys due or which may become due the CONTRACTOR under this Contract.

C. CONTRACTOR shall, to the fullest extent permitted by Laws or Regulations, defend, indemnify and hold harmless CITY, DESIGN PROFESSIONAL, 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 (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or resulting from any claim or action, legal or equitable, brought by any such owner or occupant against CITY, DESIGN PROFESSIONAL or any other party indemnified hereunder to the extent caused by or based upon CONTRACTOR's performance of the Work.

D. During the progress of the Work, CONTRACTOR shall keep the Site and the other areas 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 Site and other areas as well as all tools, appliances, construction equipment and machinery and surplus materials. CONTRACTOR shall leave the Site clean and ready for utilization or occupancy by CITY at Substantial Completion of the Work. CONTRACTOR shall restore to all property not designated for alteration by the Contract Documents to its pre-Work condition.

E. 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.

6.13 Record Documents

A. CONTRACTOR shall maintain in a safe place at the Site one record copy of all Drawings, Specifications, Addenda, the Contract, Written Amendments, Change Orders, Work

Change Directives, and written interpretations and clarifications 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 CITY and DESIGN PROFESSIONAL for reference. Upon completion of the Work, these record documents, Samples and Shop Drawings will be delivered to DESIGN PROFESSIONAL for CITY.

6.14 Safety and Protection

A. CONTRACTOR shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. CONTRACTOR shall comply with all applicable Laws or Regulations relating to the safety of persons or property to protect them from damage, injury or loss; and shall erect and maintain all necessary safeguards for safety and protection. CONTRACTOR shall deliver to CITY a copy of CONTRACTOR'S Health and Safety Plan as provided in the Notice of Intent to Contract.

B. CONTRACTOR shall notify owners of adjacent property and of Underground Facilities and other 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 6.14 B.2 or 6.14 B.3 caused, directly or indirectly, in whole or in part, by CONTRACTOR, any Subcontractor, Supplier or any other person or organization directly or indirectly employed by any of them to perform or furnish any of the Work or anyone for whose acts any of them may be liable, shall be remedied by CONTRACTOR (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of CITY, DESIGN PROFESSIONAL, Consultant, or anyone employed by any of them or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of CONTRACTOR, Subcontractor, Supplier or other person or organization directly or indirectly employed by any of them). 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 DESIGN PROFESSIONAL has issued a notice to CONTRACTOR in accordance with Paragraph 14.07 that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion). CONTRACTOR shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:

1. all persons on the Site or who may be affected by the Work;

2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and

3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities and Underground Facilities not designated for removal, relocation or replacement in the course of the Work.

6.15 Safety Representative

A. In accordance with OSHA standards, CONTRACTOR shall designate a qualified and experienced safety representative whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs. CONTRACTOR's safety representative shall remain at the Site whenever there is Work in progress and shall immediately notify CITY of any emergencies or accidents occurring at the Site

6.16 Hazard Communication Programs

A. 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.

6.17 Emergencies

A. 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 CITY or DESIGN PROFESSIONAL, is obligated to act to prevent threatened damage, injury or loss. CONTRACTOR shall give CITY and DESIGN PROFESSIONAL prompt written notice if CONTRACTOR believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby or are required as a result thereof. If CITY determines that a change in the Contract Documents is required because of the action taken by CONTRACTOR in response to an emergency, a Work Change Directive or Change Order will be issued.

B. A change in the Contract Documents pursuant to Paragraph 6.15 A will not be an automatic authorization of, nor a condition precedent to, entitlement to adjustment in the Contract Price or Contract Times. If CITY and CONTRACTOR are unable to agree on entitlement to, or magnitude of, an equitable adjustment in the Contract Price or Contract Times, a Claim may be made therefore as provided in Article 16. However, OWNER, DESIGN PROFESSIONAL and Consultants shall not be liable to CONTRACTOR for any costs, losses or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all other dispute resolution costs) sustained by CONTRACTOR on or in connection with any other project or anticipated project.

6.18 Shop Drawings and Samples

A. CONTRACTOR shall submit Shop Drawings to DESIGN PROFESSIONAL for review and approval in accordance with the accepted schedule of Shop Drawings and Sample submittals (see Paragraph 2.07). All submittals shall be identified as DESIGN PROFESSIONAL may require and in the number of copies specified in the General Requirements. The data shown on the Shop Drawings shall be complete with respect to quantities, dimensions, specified performance and design criteria, materials and similar data to show DESIGN PROFESSIONAL the services, materials and equipment CONTRACTOR proposes to provide and to enable DESIGN PROFESSIONAL to review the information for the limited purposes required by Paragraph 6.18 D.

B. CONTRACTOR shall also submit Samples to DESIGN PROFESSIONAL for review and approval in accordance with said accepted schedule of Shop Drawings and Sample submittals. Each Sample shall be identified clearly as to material, Supplier, pertinent data such as catalog numbers and the use for which intended and otherwise as DESIGN PROFESSIONAL may require to enable DESIGN PROFESSIONAL to review the submittal for the limited purposes required by Paragraph 6.18 D. The numbers of each Sample to be submitted will be as specified in the Specifications.

C. **Submittal Procedures**:

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

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

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

c. all information relative to means, methods, techniques, sequences and procedures of construction and safety precautions and programs incident thereto; and

d. 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.

2. Each submittal shall 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.

3. At the time of each submission, CONTRACTOR shall give DESIGN PROFESSIONAL specific written notice of such variations, if any, that the Shop Drawing or Sample submitted may have from the requirements of the Contract Documents, the 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 DESIGN PROFESSIONAL for review and approval of each such variation.

D. **DESIGN PROFESSIONAL's Review**:

1. DESIGN PROFESSIONAL will review and approve Shop Drawings and Samples in accordance with the schedule of Shop Drawings and Sample submittals accepted by DESIGN PROFESSIONAL as required by Paragraph 2.06. DESIGN PROFESSIONAL's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation into 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.

2. DESIGN PROFESSIONAL'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.

3. DESIGN PROFESSIONAL'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 DESIGN PROFESSIONAL's attention to each such variation at the time of submission as required by Paragraph 6.18 C.3, and DESIGN PROFESSIONAL has given written approval of each such variation by specific written notation thereof incorporated into or accompanying the Shop Drawing or Sample approval; nor will any approval by DESIGN PROFESSIONAL relieve CONTRACTOR from responsibility for complying with the requirements of Paragraph 6.18 C.1.

E. Where a Shop Drawing or Sample is required by the Contract Documents or the schedule of Shop Drawings and Sample submissions accepted by DESIGN PROFESSIONAL as required by Paragraph 2.06, any related Work performed prior to DESIGN PROFESSIONAL's review and approval of the pertinent submittal will be at the sole expense and responsibility of CONTRACTOR.

F. CONTRACTOR shall make corrections required by DESIGN PROFESSIONAL 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 DESIGN PROFESSIONAL on previous submittals.

6.19 Continuing the Work

A. CONTRACTOR shall carry on the Work and adhere to the progress schedule during all disputes or disagreements with CITY No Work shall be delayed or postponed pending resolution of any disputes or disagreements, except as permitted by Paragraph 15.04 or as CITY and CONTRACTOR may otherwise agree in writing.

6.20 CONTRACTOR's General Warranty and Guarantee

A. CONTRACTOR warrants and guarantees to CITY, DESIGN PROFESSIONAL and 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:

1. abuse, modification or improper maintenance or operation by persons other than CONTRACTOR, Subcontractors, Suppliers or any other individual or entity for whom CONTRACTOR is responsible; or

2. normal wear and tear under normal usage.

B. 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:

1. observations by DESIGN PROFESSIONAL;

2. recommendation of any progress or final payment by DESIGN PROFESSIONAL;

3. the issuance of a certificate of Substantial Completion or any payment related thereto by CITY to CONTRACTOR;

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

5. any review and approval of a Shop Drawing or Sample submittal or the issuance of a notice of acceptability by DESIGN PROFESSIONAL;

6. any inspection, test or approval by others; or

7. any correction of defective Work by CITY.

C. Nonconforming Work is rejected unless expressly accepted in writing by the CITY's Representative.

ARTICLE 7 OTHER WORK

7.01 Related Work at Site

A. CITY may perform other work related to the Project at the Site by CITY's own forces, or let other direct contracts therefore, or have other work performed by utility owners. If such other work is to be performed and such fact was not noted in the Contract Documents, then:

1. Written notice thereof will be given to CONTRACTOR prior to starting any such other work, and

2. CONTRACTOR may make a Claim therefore as provided in Article 16 if CONTRACTOR believes that such performance involves additional expense to CONTRACTOR or requires additional time and the parties are unable to agree as to the amount or extent thereof.

B. CONTRACTOR shall afford each other contractor who is a party to such a direct contract, and each utility owner (and CITY, if CITY is performing the additional work with CITY's employees) proper and safe access to the Site and a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such 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 properly connect or otherwise make its several parts come together and properly 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 CITY 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 CITY and such utility owners and other contractors.

C. 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 CITY and DESIGN PROFESSIONAL in writing any delays, defects or deficiencies in such other work that render it unavailable or unsuitable for the proper execution or results of CONTRACTOR's Work. CONTRACTOR's failure to report same 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.

7.02 Coordination

A. If CITY contracts with others for the performance of other work on the Project at the Site, the following will be set forth in Supplementary Conditions:

1. the person, firm or corporation who will have authority and responsibility for coordination of the activities among the various prime contractors will be identified;
2. the specific matters to be covered by such authority and responsibility will be itemized; and
3. the extent of such authority and responsibilities will be provided.

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

ARTICLE 8 CITY'S RESPONSIBILITIES

8.01 Communications to CONTRACTOR

A. Except as otherwise provided in these General Conditions, CITY shall issue all communications to CONTRACTOR.

8.02 Replacement of DESIGN PROFESSIONAL

A. In case of termination of the employment of DESIGN PROFESSIONAL, CITY shall appoint a DESIGN PROFESSIONAL whose status under the Contract Documents shall be that of the former DESIGN PROFESSIONAL.

8.03 Furnish Data and Prompt Payment

A. CITY shall promptly furnish the data required of OWNER under the Contract Documents and shall make payments to CONTRACTOR when they are due.

8.04 Lands and Easements; Reports and Tests

A. CITY's duties in respect of providing lands and easements and providing engineering surveys to establish reference points are set forth in Paragraphs 4.01 and 4.05. Paragraph 4.02 refers to CITY's duty to identify and make available to CONTRACTOR copies of reports of explorations and tests of subsurface conditions at the Site and drawings of physical conditions in existing structures at or contiguous to the Site that have been utilized by DESIGN PROFESSIONAL in preparing the Contract Documents.

8.05 Insurance

A. CITY's responsibilities, if any, for purchasing and maintaining liability and property insurance are set forth in Article 5 and the Supplementary Conditions.

8.06 Change Orders

A. CITY is obligated to execute Change Orders as indicated in Paragraph 10.03.

8.07 Inspections, Tests and Approvals

A. CITY's responsibility for certain inspections, tests and approvals is set forth in Paragraph 13.02 F.

8.08 Limitations on CITY's Responsibilities

A. The CITY 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 or Regulations applicable to the furnishing or performance of the Work. CITY will not be responsible for CONTRACTOR's failure to perform or furnish the Work in accordance with the Contract Documents.

8.09 Undisclosed Hazardous Environmental Condition

A. CITY's responsibility for an undisclosed Hazardous Environmental Condition uncovered or revealed at the Site is set forth in Paragraph 4.06.

8.10 Evidence of Financial Arrangements

A. CITY will furnish CONTRACTOR reasonable evidence that financial arrangements have been made to satisfy OWNER's obligations under the Contract.

8.11 CITY's Representative

A. CITY will provide a representative during the construction period. The duties, responsibilities and the limitations of authority of the CITY '"s Representative during construction are set forth in the Contract Documents.

8.12 Visits to Site

A. CITY's Representative will make visits to the Site at intervals appropriate to the various stages of construction as CITY's Representative deems necessary in order to observe 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, CITY's Representative will endeavor to determine, in general, if the Work is proceeding in accordance with the Contract Documents. CITY's Representative will not be required to make exhaustive or continuous on-Site inspections to check the quality or quantity of the Work.

ARTICLE 9 DESIGN PROFESSIONAL's STATUS DURING CONSTRUCTION

9.01 General Scope of DESIGN PROFESSIONAL's Duties

A. DESIGN PROFESSIONAL's efforts will be directed toward providing for CITY a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of visits to the Site and on-Site observations, DESIGN PROFESSIONAL will keep CITY informed of the progress of the Work and will endeavor to guard CITY against defective Work. DESIGN PROFESSIONAL's visits to the Site and on-Site observations are subject to all the limitations on DESIGN PROFESSIONAL's authority and responsibility set forth in Paragraph 9.08.

9.02 Resident Project Representative

A. If CITY and DESIGN PROFESSIONAL agree, DESIGN PROFESSIONAL will furnish a resident Project representative to assist DESIGN PROFESSIONAL in providing more extensive observation of the Work. The responsibilities, authority and limitations thereon of any such resident Project representative and assistants will be as provided in Paragraph 9.08 and in the Supplementary Conditions.

9.03 Clarifications and Interpretations

A. DESIGN PROFESSIONAL will issue with reasonable promptness written clarifications or interpretations (which may be in the form of Drawings) of the requirements of the Drawings and Specifications prepared by the DESIGN PROFESSIONAL as DESIGN PROFESSIONAL may determine necessary, which shall be consistent with the intent of and reasonably inferable from the Contract Documents. Such written clarifications and interpretations will be binding on CITY and CONTRACTOR. If CITY or CONTRACTOR believes that a written clarification or

interpretation justifies an adjustment in the Contract Price pursuant to Article 11 and/ or the Contract Times pursuant to Article 12 and the parties are unable to agree to the amount or extent thereof, if any, a Claim may be made therefore as provided in Article 16.

9.04 Rejecting Defective Work

A. DESIGN PROFESSIONAL will have authority to disapprove or reject Work which DESIGN PROFESSIONAL believes to be defective, that DESIGN PROFESSIONAL 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. DESIGN PROFESSIONAL will also have authority to require special inspection or testing of the Work as provided in Paragraph 13.04 B, whether or not the Work is fabricated, installed or completed.

9.05 Shop Drawings, Change Orders and Payments

A. In connection with DESIGN PROFESSIONAL's authority as to Shop Drawings and Samples, see Paragraph 6.18.

B. In connection with DESIGN PROFESSIONAL's authority as to Change Orders, see Article 10.

C. In connection with DESIGN PROFESSIONAL's authority as to Applications for Payment, see Article 14.

9.06 Determinations for Unit Prices

A. DESIGN PROFESSIONAL will initially determine the actual quantities and classifications of Unit Price Work performed by CONTRACTOR. DESIGN PROFESSIONAL will review with CONTRACTOR the DESIGN PROFESSIONAL's preliminary determinations on such matters before rendering a written opinion thereon (by recommendation of an Application for Payment or otherwise to the CITY). CITY reserves the right to make a final determination of the actual quantities and classifications of Unit Price Work in reviewing an Application for Payment. Within ten (10) days after the date of receipt of any such decision, CONTRACTOR may deliver to CITY and to DESIGN PROFESSIONAL written notice of intention to appeal CITY's decision pursuant to Article 16.

9.07 Decisions on Requirements of Contract Documents and Acceptability of Work

A. DESIGN PROFESSIONAL will be the initial interpreter of the requirements of the Drawings and Specifications prepared by DESIGN PROFESSIONAL and judge of the acceptability of the Work thereunder.

B. When functioning as interpreter and judge under this Paragraph 9.07, DESIGN PROFESSIONAL will not show partiality to OWNER or CONTRACTOR.

C. Claims, disputes and other matters relating to the acceptability of the Work, quantities and classifications of Unit Price Work, or the interpretation of the requirements of the Contract Documents pertaining to the performance and furnishing of the Work will be referred initially to CITY's Representative in writing with a request for a formal decision in accordance with Article 16.

9.08 Limitations on DESIGN PROFESSIONAL's Authority and Responsibilities

A. Neither DESIGN PROFESSIONAL's authority or responsibility under this Article 9 or under any other provision of the Contract Documents nor any decision made by DESIGN PROFESSIONAL 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 DESIGN PROFESSIONAL shall create, impose or give rise to any duty owed by DESIGN PROFESSIONAL to CONTRACTOR, any Subcontractor, any Supplier, any other person or organization, or to any surety for or employee or agent of any of them.

B. DESIGN PROFESSIONAL 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 or Regulations applicable to the furnishing or performance of the Work. DESIGN PROFESSIONAL will not be responsible for CONTRACTOR's failure to perform or furnish the Work in accordance with the Contract Documents.

C. DESIGN PROFESSIONAL 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.

D. DESIGN PROFESSIONAL'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 14.07 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.

E. The limitations upon authority and responsibility set forth in this Paragraph 9.08 shall also apply to DESIGN PROFESSIONAL's Consultants, resident Project representative and assistants as identified in the Supplementary Conditions.

ARTICLE 10 CHANGES IN THE WORK

10.01 Authorized Changes in the Work

A. Without invalidating the Contract and without notice to any surety, CITY 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 that will be performed under the applicable conditions of the Contract Documents (except as otherwise specifically provided).

B. If CITY and CONTRACTOR are unable to agree on entitlement to, or on the amount or extent, if any, of an adjustment in the Contract Price pursuant to Article 11 or an adjustment of the Contract Times pursuant to Article 12 or both that should be allowed as a result of a Work Change Directive, a Claim may be made therefore as provided in Article 16.

10.02 Unauthorized Changes in the Work

A. CONTRACTOR shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents as amended, modified or supplemented as provided in Paragraph 3.04, except in the case of an emergency as provided in Paragraph 6.17 or in the case of uncovering Work as provided in Paragraph 13.04.

10.03 Signing of Change Orders

A. CITY and CONTRACTOR, and DESIGN PROFESSIONAL shall sign appropriate Change Orders covering:

1. changes in the Work which are:

    a. ordered by CITY pursuant to Paragraph 10.01 A; or

    b. required because of acceptance of defective Work under Paragraph 13.08 or correcting defective Work under Paragraph 13.09; or

    c. agreed to by the parties;

2. changes in the Contract Price or Contract Times or both which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive; and

3. changes in the Contract Price or Contract Times or both which embody the substance of any written decision recommended by DESIGN PROFESSIONAL and approved by CITY pursuant to Paragraph 9.06, provided that, in lieu of signing any such Change Order, an appeal may be taken from any such decision in accordance with the provisions of the Contract Documents and applicable Laws or Regulations, but during any such appeal, CONTRACTOR shall carry on the Work and adhere to the progress schedule as provided in Paragraph 6.19.

10.04 Notification to Surety

A. 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 or both) 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

11.01 Change of Contract Price

A. 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.

B. The Contract Price may only be changed by a Change Order. Any request for an adjustment in the Contract Price shall be based on written notice delivered within fourteen (14) calendar days after occurrence of the event giving rise to the request or within fourteen (14) calendar days after first recognition of the conditions giving rise to the request. Prior notice is not required for requests or claims relating to an emergency endangering life or property as described in Paragraph 6.16. Thereafter, the CONTRACTOR shall submit written documentation of its request, including appropriate supporting documentation, within ten (10) calendar days after giving notice, unless the CITY grants an extension based on good cause shown by the CONTRACTOR that such additional time is warranted.

C. The value of any Work covered by a Change Order or of any request for an adjustment in the Contract Price will be determined as follows:

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 Paragraph 11.04); or

2. where the Work involved is not covered by Unit Prices contained in the Contract Documents, by a mutually agreed lump sum; or

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 11.01 C.2, on the basis of the Cost of the Work (determined as provided in Paragraphs 11.02 A and B) plus a CONTRACTOR's fee for overhead and profit (determined as provided in Paragraph 11.01 D).

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

1. a mutually acceptable fixed fee; or

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:

a. for costs incurred under Paragraphs 11.02 A.1 and 11.02 A.2, the CONTRACTOR's fee shall be ten percent (10%);

b. for costs incurred under Paragraph 11.02 A.3, the CONTRACTOR's fee shall be five percent (5%);

c. where one or more tiers of subcontracts are on the basis of the Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraphs 11.01 D.2 and 11.02 A.1 through A.3 is that the Subcontractor who actually performs or furnishes the Work, at whatever tier, will be a paid a fee of ten percent (10%) of the costs incurred by such Subcontractor under Paragraphs 11.02 A.1 and 11.02 A.2 and that any higher tier Subcontractor and CONTRACTOR will each be paid a fee of five percent (5%) of the amount paid to the next lower tier Subcontractor;

d. no fee shall be payable on the basis of costs itemized under Paragraphs 11.02 A.4, 11.02 A.5 and 11.02 B;

e. the amount of credit to be allowed by CONTRACTOR to CITY for any change which results in a net decrease in cost will be the amount of the actual net decrease in costs plus a deduction in CONTRACTOR's fee by an amount equal to five percent (5%) of such net decrease; and

f. 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 11.01 D.2.a through 11.01 D.2.e, inclusive.

E. Whenever the Cost of the Work is to be determined pursuant to Paragraphs 11.02 A and B, CONTRACTOR shall establish and maintain records thereof in accordance with generally accepted accounting practices and submit in form acceptable to CITY an itemized cost breakdown together with supporting data.

11.02 Cost of the Work

A. 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. When the value of any Work covered by a Change Order or when a request for an adjustment in Contract Price is determined on the basis of Cost of the Work, the costs to be reimbursed to CONTRACTOR will be only those additional or incremental costs required because of the change in the Work or because of the event giving rise to the request. Except as otherwise agreed to in writing by CITY, costs covered by Change Orders or requests 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 costs itemized in 11.02 B:

1. Payroll costs for employees in the direct employ of CONTRACTOR in the performance of the Work, using occupational titles and job classifications agreed upon by CITY and CONTRACTOR. Such employees shall include, without limitation, job Site 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 the Work after regular working hours, on Saturdays, Sundays or legal holidays, shall be included in the above to the extent authorized by OWNER.

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

3. Payments made by CONTRACTOR to Subcontractors for Work performed or furnished by Subcontractors. If required by CITY, CONTRACTOR shall obtain competitive bids from Subcontractors acceptable to OWNER and CONTRACTOR and shall deliver such bids to CITY who will then determine, with the advice of DESIGN PROFESSIONAL, which bids, if any, will be accepted. If any subcontract provides that the Subcontractor is to be paid on the basis of the 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 11.01 D and E and 11.02 A and B. All subcontracts shall be subject to the other provisions of the Contract Documents insofar as applicable.

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 when such services are approved in advance by CITY in writing.

5. Other costs including the following:

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

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

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

d. Applicable sales, consumer, use or similar taxes related to the Work**,** and for which CONTRACTOR is liable, imposed by Laws or Regulations.

e. 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, and royalty payments and fees for permits and licenses required to perform the Work.

f. 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 CITY in accordance with Article 5), 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 CITY. 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 those services a fee proportionate to that stated in Paragraph 11.01 D.2.

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

h. 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.

i. Cost of premiums for additional or increased Bonds, or for insurance required because of approved changes in the Work.

B. Costs excluded: The term “Cost of the Work” shall not include any of the following:

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 (if not specifically included in the agreed upon occupational titles and job classifications referred to in Paragraph 11.02 A.1 or specifically covered by Paragraph 11.02 A.4), all of which are to be considered administrative costs covered by the CONTRACTOR’s fee.

2. Expenses of CONTRACTOR’s principal and branch offices other than CONTRACTOR’s office at the Site.

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.

4. 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.

5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraph 11.02 A.

11.03 Cash Allowances

A. 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 CITY. CONTRACTOR agrees that:

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

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.

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

11.04 Unit Price Work

A. 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 Contract. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Determinations of the actual quantities and classifications of Unit Price Work performed by CONTRACTOR will be made in accordance with Paragraph 9.06.

B. 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.

C. CITY or CONTRACTOR may negotiate an adjustment of the price per unit of Unit Price Work stated in the Contract if:

1. the quantity of any item of Unit Price Work performed by CONTRACTOR differs by twenty percent (20%) or more from the estimated quantity of such item indicated in the Contract; and

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

3. CONTRACTOR believes that CONTRACTOR is entitled to an increase in Contract Price as a result of having incurred additional expense or CITY believes that CITY is entitled to a decrease in Contract Price.

11.05 Dispute Resolution

A. If CITY and CONTRACTOR are unable to agree on entitlement to, or magnitude of, an equitable adjustment in the Contract Price in accordance with Article 11 within fourteen (14) calendar days from the receipt of supporting documentation of the request pursuant to 11.01.B., unless the CITY grants an extension based on good cause shown by the CONTRACTOR that such additional time is warranted, then a Claim for such adjustment may be made pursuant to Article 16.

ARTICLE 12 CONTRACT TIMES

12.01 Time of the Essence

A. All times stated in the Contract Documents are of the essence of the Contract.

12.02 Change of Contract Times

A. The Contract Times (or Milestones) may only be changed by a Change Order. Any request for an adjustment in the Contract Times shall be based on written notice delivered within fourteen (14) calendar days after occurrence of the event giving rise to the request or within fourteen (14) calendar days after first recognition of the conditions giving rise to the request. Thereafter, the CONTRACTOR shall submit written documentation of its requests, including appropriate supporting documentation, within ten (10) days after giving notice, unless the CITY grants an extension based on good cause shown by the CONTRACTOR that such additional time is warranted.

12.03 Proof Required To Justify an Extension of Time For Excusable and Compensable Delays

A. In support of any request for an extension of the Contract Times pursuant to this Article, CONTRACTOR must demonstrate to the reasonable satisfaction of the CITY that the critical path of the approved baseline project schedule was delayed. CONTRACTOR shall be entitled to an increase in contract time for the number of days that the critical path was delayed solely as a result of the compensable or excusable event. A compensable or excusable event includes, but is not limited to:

1. unreasonable delay of issuance of Notice to Proceed by CITY;
2. CITY's unreasonable delay of delivery furnished materials, equipment, or work;
3. unreasonable delay responding to shop drawings and submittals;
4. CITY's unreasonable delay in issuing a Change Order;
5. an order by the CITY to stop the Work where the CONTRACTOR was not at fault; and
6. other reasonable grounds as determined by the City in its sole discretion.

B. CONTRACTOR shall compare the critical path of the approved baseline project schedule to the actual critical path of the Work, identifying the specific impact of the compensable or excusable event.

C. CONTRACTOR shall submit to the CITY a written time impact analysis illustrating the influence of each compensable or excusable event on the date of Substantial Completion. The

time impact analysis shall demonstrate the time impact based on the date of the delay in time and the event time computations or all affected activities.

D. If the critical path of the Work is delayed by "Force Majeure", the CONTRACTOR shall be entitled only to an extension of the Contract Times for the number of days of delay to the critical path. For purposes of this paragraph, "Force Majeure" shall mean fire, tornado, flood, earthquake, war, act of terrorism, civil disturbance, or labor strikes away from the project site.

E. Extensions of contract time pursuant to the this section will be granted only to the extent that the time adjustments exceed the total float time available when the event causing the delay occurred.

12.04 Delays Within CONTRACTOR's Control

A. The Contract Times (or Milestones) will not be extended due to delays within the control of CONTRACTOR. Delays attributable to and within the control of a Subcontractor or Supplier shall be deemed to be delays within the control of CONTRACTOR.

12.05 Delays Beyond the CITY's and CONTRACTOR's Control

A. Where CONTRACTOR is prevented from completing any part of the Work within the Contract Times (or Milestones) due to delay beyond the control of both CITY and 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.

12.06 Delay Damages

A. In no event shall CITY 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:

1. delays caused by or within the control of CONTRACTOR, or

2. delays beyond the control of CITY or CONTRACTOR including but not limited to fires, floods, epidemics, abnormal weather conditions, acts of God or acts or neglect by utility owners or other contractors performing other work as contemplated by Article 7.

B. Nothing in this Paragraph 12.06 bars a change in Contract Price pursuant to this Article 12 to compensate CONTRACTOR due to delay, interference, or disruption directly attributable to actions or inaction of CITY, DESIGN PROFESSIONAL, Consultant or anyone for whom CITY, DESIGN PROFESSIONAL or Consultant is responsible.

12.07 Dispute Resolution

A. If CITY and CONTRACTOR are unable to agree on entitlement to, or magnitude of, an equitable adjustment in the Contract Time in accordance with Article 12 within fourteen (14) calendar days from the receipt of supporting documentation of the request pursuant to 12.02, unless the CITY grants an extension based on good cause shown by the CONTRACTOR that such additional time is warranted, then a Claim for such adjustment may be made pursuant to Article 16.

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

13.01 Access to Work

A. CITY, DESIGN PROFESSIONAL, Consultants, other representatives and personnel of CITY, independent testing laboratories and governmental agencies with jurisdictional interests will have access to the Site and 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.

13.02 Tests and Inspections

A. CONTRACTOR shall give DESIGN PROFESSIONAL and CITY's Representative 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.

B. If any Work (or the work of others at the Site) that is to be inspected, tested or approved is covered by CONTRACTOR without written approval required by Paragraphs 13.02 D or 13.02 E, it must, if requested by CITY's Representative, be uncovered for observation.

C. Uncovering Work as provided in Paragraph 13.02 B, shall be at CONTRACTOR's expense unless CONTRACTOR has given DESIGN PROFESSIONAL and CITY's Representative timely notice of CONTRACTOR's intention to cover the same and DESIGN PROFESSIONAL and CITY's Representative have not acted with reasonable promptness in response to such notice.

D. If Laws or Regulations of any public body (including City) 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 DESIGN PROFESSIONAL and CITY's Representative the required certificates of inspection or approval.

E. CONTRACTOR shall be responsible for arranging and obtaining and shall pay all costs in connection with any inspections, tests or approvals required for CITY's and DESIGN PROFESSIONAL's acceptance of materials or equipment to be incorporated into the Work, or acceptance of materials, mix designs, or equipment submitted for approval prior to CONTRACTOR's purchase thereof for incorporation into the Work. Such inspections, tests, or approvals shall be performed by organizations acceptable to CITY and DESIGN PROFESSIONAL.

F. CITY 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:

1. for inspections, tests or approvals covered by Paragraph 13.02 D and E;

2. that costs incurred in connection with tests or inspections conducted pursuant to Paragraph 13.04 B shall be paid as provided in said Paragraph 13.04 B; and

3. as otherwise specifically provided in the Contract Documents.

13.03 Notice of Defects

A. Prompt notice of all defective Work of which either CITY or DESIGN PROFESSIONAL has actual knowledge will be given to CONTRACTOR. Defective Work may be rejected, corrected or accepted as provided in this Article 13.

13.04 Uncovering Work

A. If any Work (or the work of others at the Site) is covered contrary to the written request of DESIGN PROFESSIONAL or CITY's Representative, it must, if requested by CITY's Representative, be uncovered for DESIGN PROFESSIONAL's or CITY's Representative's observation and replaced at CONTRACTOR's expense.

B. If CITY considers it necessary or advisable that covered Work be observed by DESIGN PROFESSIONAL or CITY's Representative or be inspected or tested by others, CONTRACTOR, at CITY's request, shall uncover, expose or otherwise make available for observation, inspection or testing as may be required, 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 costs, losses and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) 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 CITY shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount thereof, CITY may make a Claim therefore as provided in Article 16. If, however, such Work is not found to be defective, CONTRACTOR shall be allowed an increase in the Contract Price or an extension of the Contract Times (or Milestones), or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement and reconstruction. If the parties are unable to agree as to the amount or extent thereof, CONTRACTOR may make a Claim therefore as provided in Article 16.

13.05 CITY May Stop the Work

A. 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, CITY may order CONTRACTOR to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of CITY to stop the Work shall not give rise to any duty on the part of CITY to exercise this right for the benefit of CONTRACTOR, any Subcontractor, Supplier, other individual or entity or any surety or employee or agent of any of them.

13.06 Correction or Removal of Defective Work

A. If required by CITY, 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 either DESIGN PROFESSIONAL or CITY's Representative, remove it and replace it with Work that is not defective. CONTRACTOR shall pay all costs, losses and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) caused by or resulting from such correction or removal (including but not limited to all costs of repair or replacement of work of others).

13.07 Correction Period

A. If within one (1) year after the date of Substantial Completion, or such longer period of time as may be prescribed by Laws or Regulations, 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, or if the repair of any damages to the land or areas made available for CONTRACTOR's use by CITY or permitted by Laws and Regulations as contemplated in Paragraph 6.10 is found to be defective, CONTRACTOR shall promptly, without cost to CITY and in accordance with CITY's written instructions:

1. correct the repair of damages to such land or areas; or

2. correct such defective Work, or if it has been rejected by CITY, remove it from the Site and replace it with Work that is not defective; and

3. satisfactorily correct or remove and replace any damage to other Work or to the work of others or damage to other lands or areas resulting therefrom. If CONTRACTOR does not promptly comply with the terms of such instructions, or in the event of an emergency where delay by CONTRACTOR would cause serious risk of loss or damage, CITY may have the defective Work corrected or the rejected Work removed and replaced, and all costs, losses and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) 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.

B. 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.

C. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this Paragraph 13.07, the correction period hereunder

with respect to such Work will be extended for an additional period of one (1) year, or such longer period of time as may be prescribed within Paragraph 13.07 A, after such correction or removal and replacement has been satisfactorily completed.

D. CONTRACTOR's obligations under this Paragraph 13.07 are in addition to any other obligation or warranty. The provisions of this Paragraph 13.07 shall not be construed as a substitute for or waiver of the provisions of any applicable statute of limitation or repose.

13.08 Acceptance of Defective Work

A. If, instead of requiring correction or removal and replacement of defective Work, CITY prefers to accept it, CITY may do so. CONTRACTOR shall pay all costs, losses and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) attributable to CITY's evaluation of and determination to accept such defective Work and shall pay OWNER for the diminished value of the Work. If any such acceptance occurs prior to DESIGN PROFESSIONAL's recommendation of final payment, a Change Order will be issued incorporating the necessary revisions into the Contract Documents with respect to the Work and, due to the diminished value of the Work, CITY shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount thereof, CITY may make a Claim therefore as provided in Article 16. If the acceptance of defective Work occurs after such recommendation, an appropriate amount shall be paid by CONTRACTOR to CITY.

13.09 CITY May Correct Defective Work

A. If CONTRACTOR fails within a reasonable time after written notice from DESIGN PROFESSIONAL or CITY's Representative to correct defective Work or to remove and replace rejected Work as required by CITY in accordance with Paragraph 13.06, 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, CITY may, after seven (7) days written notice to CONTRACTOR, correct and remedy any such deficiency.

B. CITY shall proceed expeditiously when exercising the rights and remedies under this Paragraph 13.09. In connection with such corrective and remedial action, CITY 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 into the Work all materials and equipment stored at the Site or for which CITY has paid CONTRACTOR but which are stored elsewhere. CONTRACTOR shall allow CITY, CITY's Representative, agents and employees, CITY's other contractors, DESIGN PROFESSIONAL and Consultants access to the Site to enable CITY to exercise the rights and remedies under this Paragraph 13.09.

C. All costs, losses and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred or sustained by CITY in exercising such rights and remedies will be charged against CONTRACTOR and a Change Order will be issued incorporating the necessary revisions into the Contract Documents with respect to the Work; and CITY shall be entitled to an appropriate decrease in the Contract Price. If CITY and CONTRACTOR are unable to agree as to the amount thereof, CITY may make a Claim therefore as provided in Article 16. Such Claims for 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 and replacement of CONTRACTOR's defective or rejected Work.

D. 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 CITY of CITY's rights and remedies under Paragraphs 13.06 and 13.09.

ARTICLE 14 PAYMENTS TO CONTRACTOR AND COMPLETION

14.01 Schedule of Values

A. 01290.02 Schedule of Values established as provided in Article 2 will serve as the basis for progress payments and will be incorporated into form 01290.01 Application for Payment acceptable to DESIGN PROFESSIONAL and CITY. Progress payments for Unit Price Work will be based on the number of units completed.

14.02 Application for Progress Payments

A. Application for Payment

1. At least twenty (20) days before the date stipulated in the Supplementary Conditions for each progress payment (but not more often than once a month), CONTRACTOR shall submit to DESIGN PROFESSIONAL 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 into 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, paid invoice or other documentation warranting that CITY has received the materials and equipment free and clear of all Liens and evidence that the materials and equipment are covered by appropriate property insurance and other arrangements to protect CITY"'s interest therein, all of which will be subject to CITY's approval.

2. Beginning with the second Application for Payment, each Application shall include:

a. an affidavit of CONTRACTOR stating that all previous progress payments received for the Work have been applied to discharge CONTRACTOR's legitimate obligations associated with prior Applications for Payment, and

b. a copy of the most recent 00485.01 M/WBE Monthly Utilization Report CONTRACTOR has submitted to the CITY's Civil Rights and Equal Opportunity Department.

c. a copy of the most recent 00485.02 Project Workforce Monthly Report and 00485.03 Company-Wide Workforce Monthly Report CONTRACTOR has submitted to the OWNER's Civil Rights and Equal Opportunity Department.

d. an update to the approved schedule pursuant to paragraphs 6.04 and 6.05.

3. The amount of retainage with respect to progress payments will be stated in the Supplementary Conditions.

B. Review of Applications

1. DESIGN PROFESSIONAL will, within ten (10) days after receipt of each Application for Payment, either indicate in writing a recommendation of payment and present the Application to CITY, or return the Application to CONTRACTOR indicating in writing DESIGN PROFESSIONAL's reasons for refusing to recommend payment. In the latter case, CONTRACTOR shall make the necessary corrections and resubmit the Application.

a. After presentation of the Application for Payment to CITY, and if CITY's Representative agrees with DESIGN PROFESSIONAL's recommendation, the amount recommended will (subject to the provisions of Paragraph 14.02 B.4) become due and will be paid by CITY to CONTRACTOR, subject to the provisions of Laws or Regulations.

b. No payment shall be approved until the CONTRACTOR has submitted with the Application accompanying documentation as required by the Contract Documents, including, but not limited to, the documentation required by paragraphs 6.04 and 6.05.

2. DESIGN PROFESSIONAL's recommendation of any payment requested in an Application for Payment will constitute a representation by DESIGN PROFESSIONAL to CITY, based on DESIGN PROFESSIONAL's observations of the executed Work as an experienced and qualified DESIGN PROFESSIONAL and on DESIGN PROFESSIONAL's

review of the Application for Payment and the accompanying data and schedules, that to the best of DESIGN PROFESSIONAL's knowledge, information and belief:

a. the Work has progressed to the point indicated;

b. 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 9.06, and to any other qualifications stated in the recommendation); and

c. the conditions precedent to CONTRACTOR being entitled to such payment appear to have been fulfilled in so far as it is DESIGN PROFESSIONAL's responsibility to observe the Work.

3. DESIGN PROFESSIONAL's recommendation of any payment, including final payment, shall not mean that DESIGN PROFESSIONAL is responsible for CONTRACTOR's means, methods, techniques, sequence or procedures of construction, safety precautions and programs incident thereto, or any failure of CONTRACTOR to comply with Laws or Regulations applicable to the furnishing or performance of Work.

4. DESIGN PROFESSIONAL may refuse to recommend the whole or any part of any payment if, in DESIGN PROFESSIONAL's opinion, it would be incorrect to make the representations to CITY referred to in Paragraph 14.02 B.2. DESIGN PROFESSIONAL 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 DESIGN PROFESSIONAL's opinion to protect CITY from loss because:

a. the Work is defective, or completed Work has been damaged requiring correction or replacement;

b. the Contract Price has been reduced by Written Amendment or Change Orders;

c. CITY has been required to correct defective Work or complete Work in accordance with Paragraph 13.09; or

d. DESIGN PROFESSIONAL has actual knowledge of the occurrence of any of the events enumerated in Paragraph 15.02.

C. Reduction in Payment

1. CITY may refuse to make payment of the full amount recommended by DESIGN PROFESSIONAL because:

a. Claims have been made by third parties against CITY on account of CONTRACTOR's performance or furnishing of the Work; or

b. Claims have been made by CITY against CONTRACTOR in connection with the Work, except where CONTRACTOR has delivered a specific Bond satisfactory to CITY to secure the satisfaction and discharge of such Claims;

c. there are other items entitling CITY to a set-off against the amount recommended; or

d. CITY has actual knowledge of the occurrence of any of the events enumerated in Paragraphs 14.02 B.4.a through c or 15.02 A.1 through 4; but CITY must give CONTRACTOR written notice (with a copy to DESIGN PROFESSIONAL) stating the reasons for such action and promptly pay CONTRACTOR the amount so withheld, or any adjustment thereto agreed to by CITY and CONTRACTOR, when CONTRACTOR corrects to CITY's satisfaction the reasons for such action; or

e. CITY has made a different determination of the actual quantities and classifications of Unit Price Work.

14.03 CONTRACTOR's Warranty of Title

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

14.04 Substantial Completion

A. When CONTRACTOR considers the entire Work ready for its intended use CONTRACTOR shall notify CITY and DESIGN PROFESSIONAL in writing that the entire Work is substantially complete (except for items specifically listed by CONTRACTOR as incomplete) and request that CITY issue a certificate of Substantial Completion. Within a reasonable time thereafter, CITY, together with CONTRACTOR and DESIGN PROFESSIONAL, shall make an inspection of the Work to determine the status of completion. If DESIGN PROFESSIONAL does not consider the Work substantially complete, DESIGN PROFESSIONAL will notify CONTRACTOR and CITY in writing giving the reasons therefore. If DESIGN PROFESSIONAL considers the Work substantially complete, DESIGN PROFESSIONAL will prepare and deliver to CITY a recommended certificate of Substantial Completion that shall establish 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. CITY shall have seven (7) days after receipt of the recommended certificate during which to make written objection to DESIGN PROFESSIONAL as to any provisions of the certificate or attached list. At the time of delivery of the recommended certificate of Substantial Completion, DESIGN PROFESSIONAL will deliver to CITY and CONTRACTOR a written recommendation as to division of responsibilities pending final payment between CITY and CONTRACTOR with respect to security, operation, safety, protection of the Work, maintenance, heat, utilities, insurance and warranties and guarantees.

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

14.05 Partial Utilization

A. Use by CITY at CITY's option of any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which CITY, DESIGN PROFESSIONAL and CONTRACTOR agree constitutes a separately functioning and usable part of the Work that can be used by CITY 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:

1. CITY at any time may request CONTRACTOR in writing to permit CITY to use any such part of the Work which CITY 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 CITY and DESIGN PROFESSIONAL that such part of the Work is substantially complete and request CITY to issue a certificate of Substantial Completion for that part of the Work. CONTRACTOR at any time may notify CITY and DESIGN PROFESSIONAL in writing that CONTRACTOR considers any such part of the Work ready for its intended use and substantially complete and request CITY to issue a certificate of Substantial Completion for that part of the Work. Within a reasonable time after either such request, CITY, together with CONTRACTOR and DESIGN PROFESSIONAL, shall make an inspection of that part of the Work to determine its status of completion. If DESIGN PROFESSIONAL does not consider that part of the Work to be substantially complete, DESIGN PROFESSIONAL will notify CITY and CONTRACTOR in writing, giving the reasons therefore. If DESIGN PROFESSIONAL considers that part of the Work to be substantially complete, the provisions of Paragraph 14.04 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.

2. No occupancy or separate operation of part of the Work will be accomplished prior to compliance with the requirements of Paragraph 5.09 with respect to property insurance.

14.06 Final Inspection

A. Upon written notice from CONTRACTOR that the entire Work or an agreed portion thereof is complete, DESIGN PROFESSIONAL will make a final inspection with CITY 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.

14.07 Final Payment

A. Application for Payment

1. After CONTRACTOR has completed all corrections required by Paragraph 14.06 to the satisfaction of DESIGN PROFESSIONAL and CITY's Representative 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 5.04, certificates of inspection, marked-up record documents (as provided in Paragraph 6.13) and other documents, CONTRACTOR may make application for final payment following the procedure for progress payments.

2. The final Application for Payment shall be accompanied (except as previously delivered) by:

a. all documentation required by the Contract Documents, including but not limited to the evidence of insurance required by Subparagraph 5.04 B.7; and

b. 01290.14 "Contractor Affidavit for Final Payment" from CONTRACTOR and 01290.15 "Subcontractor Affidavit for Final Payment" from all Subcontractors, regardless of tier.

B. Review of Application and Acceptance

1. If, on the basis of DESIGN PROFESSIONAL's and CITY's Representative's observation of the Work during construction and final inspection, and DESIGN PROFESSIONAL's and CITY's Representative's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, DESIGN PROFESSIONAL and CITY's Representative are satisfied that the Work has been completed and CONTRACTOR's other obligations under the Contract Documents have been fulfilled, DESIGN PROFESSIONAL will, within ten (10) days after receipt of the final Application for Payment, indicate in writing DESIGN PROFESSIONAL's and CITY's Representative's recommendation of payment and present the Application to CITY for payment. At the same time DESIGN PROFESSIONAL will also give written notice to CITY and CONTRACTOR that the Work is acceptable subject to the provisions of Paragraph 14.09.

2. Otherwise, DESIGN PROFESSIONAL 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 to DESIGN PROFESSIONAL. After the presentation to CITY of the Application and accompanying documentation, in appropriate form and substance, including applicable federal and state prevailing wage provisions, and with DESIGN PROFESSIONAL's recommendation and notice of acceptability, the amount recommended by DESIGN PROFESSIONAL will become due and will be paid by CITY to CONTRACTOR in accordance with Laws and Regulations.

14.08 Final Completion Delayed

A. If, through no fault of CONTRACTOR, final completion of the Work is significantly delayed and if DESIGN PROFESSIONAL so recommends and CITY concurs, CITY shall, upon

receipt of CONTRACTOR's final Application for Payment and recommendation of DESIGN PROFESSIONAL, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance to be held by CITY for Work not fully completed or corrected is less than the retainage stipulated in the Supplementary Conditions, and if Bonds have been furnished as required in Paragraph 5.01, 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 DESIGN PROFESSIONAL with the Application for Payment. Payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

14.09 Waiver of Claims

A. The making and acceptance of final payment will constitute:

1. a waiver of all claims by CITY against CONTRACTOR, except claims previously made in writing and still unsettled, or claims arising from defective Work appearing after final inspection pursuant to Paragraph 14.06, 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

2. a waiver of all Claims by CONTRACTOR against CITY other than those previously made in writing pursuant to Paragraphs 16.02 and 16.03 and still unsettled.

14.10 Completion of Work by CITY

A. If CITY must complete the Work, all costs and charges incurred by CITY, together with the cost of completing the Work under the Contract, will be deducted from any monies due or which may become due CONTRACTOR. If such expense exceeds the sum which would have been payable under the Contract, then CONTRACTOR and the surety shall be liable and shall pay to CITY the amount of such excess.

ARTICLE 15 SUSPENSION OF WORK AND TERMINATION

15.01 CITY May Suspend Work

A. Notwithstanding any other provision of this Contract, at any time and without cause, and at is sole and absolute discretion, CITY, may suspend the Work or any portion of the Work by written notice to CONTRACTOR, which will initially fix the date on which Work will be resumed. CONTRACTOR shall resume the Work on the date so fixed in the notice unless the date is changed by a subsequent written notice from CITY. CONTRACTOR may be allowed an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any suspension if CONTRACTOR makes a Claim therefore in accordance with Article 16.

B. CONTRACTOR will not be allowed an adjustment in the Contract Price or an extension of the Contract Times if CITY suspends the Work because CONTRACTOR's acts or omissions create or cause an emergency that CITY believes affects the safety or protection of persons, the Work, or property at the Site or adjacent thereto. CITY may order CONTRACTOR to stop the Work, or any portion thereof, until the cause for such order has been adequately addressed by CONTRACTOR; however, this right of CITY to stop the Work shall not give rise to any duty on the part of CITY to exercise this right for the benefit of CONTRACTOR, any Subcontractor, Supplier, other individual or entity or any surety or employee or agent of any of them.

15.02 CITY May Terminate for Default

A. CONTRACTOR may be deemed in default and CITY may terminate the services of CONTRACTOR upon the occurrence of any one or more of the following events:

1. CONTRACTOR 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 2.06 and 2.07 as adjusted from time to time pursuant to Paragraphs 6.04, 6.05, 12.02 and 12.03);

2. CONTRACTOR abandons the Work or declares its intention to abandon the Work;

3. CONTRACTOR assigns or attempts to assign its rights or obligations under this Contract or any part thereof to any third party without the prior written consent of CITY;

4. CONTRACTOR fails to make prompt payment duly owing to any subcontractor for Work completed in accordance to the Contract Documents or material supplier for materials delivered for incorporation into the Work within thirty (30) calendar days after payment was due;

5. CONTRACTOR fails to achieve the required dates of substantial and final completion;

6. CONTRACTOR disregards Laws or Regulations of any public body having jurisdiction;

7. CONTRACTOR disregards the authority of DESIGN PROFESSIONAL or OWNER; or

8. CONTRACTOR otherwise violates in any substantial way any provisions of the Contract Documents.

B. CITY may, after giving CONTRACTOR (and the surety) seven (7) days written notice and to the extent permitted by Laws or 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 into the Work all materials and equipment stored at the Site or for which CITY has paid CONTRACTOR but which are stored elsewhere, and finish the Work as CITY 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 costs, losses and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by CITY arising out of or resulting from completing the Work, such excess may be paid to CONTRACTOR. If such costs, losses and damages exceed such unpaid balance, CONTRACTOR shall pay the difference to CITY within fourteen (14) calendar days of CITY'S demand for payment. When exercising any rights or remedies under this Paragraph CITY shall not be required to competitively bid this work unless required by law.

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

D. If, after a default termination, it is determined that the CONTRACTOR was not in default, the rights and obligations of the parties shall be the same as if the termination had been issued for the convenience of the CITY. The CITY shall then be liable to CONTRACTOR for only those costs enumerated in paragraph 15.03.

15.03 CITY May Terminate for Convenience

A. Notwithstanding any other provision of this Contract, upon seven (7) calendar days written notice to CONTRACTOR, CITY may, at its sole and absolute discretion, without cause and without prejudice to any other right or remedy of CITY, elect to terminate the Contract. In such case, CONTRACTOR shall, with thirty (30) calendar days of receiving notice of termination under this paragraph, submit to CITY its statement of costs and expenses and shall be paid:

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;

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;

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

4. for reasonable expenses directly attributable to termination if approved in advance by CITY.

B. 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.

C. CONTRACTOR waives any costs not submitted to CITY pursuant to paragraph 15.03.A.

D. CITY shall, within thirty (30) calendar days after receipt of CONTRACTOR's statement, pay CONTRACTOR all amounts it determines are properly determined.

ARTICLE 16 CLAIMS AND DISPUTES

16.01 Definition

A. A Claim is a demand or assertion by the CONTRACTOR seeking, as a matter of right, the adjustment of Contract price and/or times with respect to the terms of the Contract.

16.02 Written Notice and Burden of Proof

A. Claims must be made by written notice pursuant to Paragraph 17.01. The written notice shall clearly indicate that the CONTRACTOR is making a claim. The responsibility to substantiate Claims shall rest with the CONTRACTOR. No Claim may be made under this Contract except as provided in this Article.

B. Certification of Claim: The written notice of Claim shall include the following statement signed by the CONTRACTOR's representative: "The CONTRACTOR certifies that all statements made and the facts set out in this claim are true and correct and that no false records have been submitted in support of this claim." **Strict compliance with this paragraph shall be a condition precedent to the creation, existence or validity of any Claim**.

16.03 Time Limits on Claims

A. The CONTRACTOR must give notice to the CITY within fourteen (14) calendar days after the denial of a request for or failure to reach an agreement on a change in Contract Price and/or change in Contract Time pursuant to Article 11 and Article 12 respectively. After the fourteen (14) day period for making Claims has expired, the Claim shall be considered waived.

B. The CONTRACTOR shall submit the Claim to the CITY's Representative.

16.04 Continuing Contract Performance

A. Pending final resolution of a Claim, unless otherwise agreed in writing, the CONTRACTOR shall proceed diligently with performance of the Work and the CITY shall continue to make payments in accordance with the Contract Documents. The CITY may, but is not obligated to, notify the Surety of the nature and amount of the Claim.

16.05 Injury or Damage to Person or Property

A. If either party to the Contract suffers injury or damage to person or property because of an act or omission of the other party, of any of the other party's employees or agents, or of others for whose acts that party is legally liable, written notice of the injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding thirty (30) days after first observance. The notice shall provide sufficient detail to enable the other party to investigate the matter.

16.06 Initial Resolution of Claims and Disputes

A. After the CONTRACTOR has submitted the Claim to the CITY's Representative, the CITY'S Representative and CONTRACTOR'S Representative shall conduct a settlement conference within fourteen (14) calendar days from the date of receipt of the Claim. If the Claim is not settled within seven (7) calendar days following the date of the settlement conference, the CITY'S Representative and the CONTRACTOR's Representative shall state, in writing, following the conclusion of the seven (7) calendar day period, their respective position as to the matters in dispute.

B. The CITY'S and CONTRACTOR'S statement of positions shall state all known factual grounds for each party's position. If the dispute remains unresolved at the end of the seven (7) calendar days from submission of the parties' written position statements, the CONTRACTOR shall have the right to proceed with the pursuit of Claims pursuant to paragraph 16.07.

C. If a Claim has been resolved, the OWNER will prepare or obtain appropriate documentation.

16.07 Final Resolution of Claims and Disputes

A. All administrative procedures set forth in this contract must first be exhausted before suit is filed.

B. If the CITY'S Representative and the CONTRACTOR'S Representative are unable to resolve the dispute pursuant to 16.06, the parties must submit their statements of position to the Director, who shall review the Claim and make a decision within fourteen (14) calendar days.

C. Absent fraud, gross mistake or bad faith, the Director's decision shall be final and binding on CITY and CONTRACTOR within fourteen (14) calendar days after issuance. The CONTRACTOR shall give written notice to the CITY stating its intent to submit its Claim to a court of law pursuant to paragraph 17.05.A. within thirty (30) calendar days after notice of Director's decision.

D. The time frames for the Director's decision and for CONTRACTOR'S written notice of intent may be tolled by participation in voluntary mediation. Mediator selection and the procedures to be employed in voluntary mediation shall be mutually acceptable to the parties. Costs of the mediator shall be shared equally among the parties participating in the mediation. In no event shall any time frame be tolled more than 30 days for mediation. However, mediation may be employed at any time at the discretion and mutual agreement of the parties.

E. If the dispute is not resolved during voluntary mediation, The CONTRACTOR agrees that it will file no suit based on facts or evidentiary materials that were not presented for consideration to the CITY during the mediation process or of which the CONTRACTOR had knowledge and failed to present during the administrative procedures.

ARTICLE 17 MISCELLANEOUS

17.01 Giving Notice

A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be given by personal delivery, by registered or certified mail, postage prepaid, to the last business address known to the giver of the notice or by confirmed electronic facsimile transmission. Notice is effective on the date of personal delivery, deposit of registered or certified mail, postage prepaid, or confirmed electronic facsimile transmission.

17.02 Computation of Times

A. When any period of time is referred to in the Contract Documents by days, it will be computed to exclude the first and include the last calendar day of such period. If the last day of such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

17.03 Cumulative Remedies

A. 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 and all of the rights and remedies available to CITY and DESIGN PROFESSIONAL hereunder 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.

17.04 Survival of Obligations

A. 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 or termination or completion of the Contract.

17.05 Controlling Law

A. This Contract shall be construed and governed in accordance with the laws of the State of Missouri without giving effect to Missouri's choice of law provisions. The CITY and CONTRACTOR: (1) shall submit exclusively to the jurisdiction of the state and federal courts located in Jackson County, Missouri and no other; (2) shall waive any and all objections to jurisdiction and venue; and (3) shall not raise forum non conveniens as an objection to the location of any litigation.

CITY OF FOUNTAINS
HEART OF THE NATION
KANSAS CITY
MISSOURI

SUPPLEMENTARY CONDITIONS

Project Number 80002543/9911

Project Title Modernization Improvements at the WTP Phase II – Replacement Vertical Wells 2-5

These Supplementary Conditions amend or supplement the General Conditions of the Construction Contract and other provisions of the Contract Documents as indicated below. All provisions that are not so amended or supplemented remain in full force and effect.

SC-4.02 Article 4, Paragraph 4.02, Subsurface and Physical Conditions; Subparagraphs A and B are supplemented as follows:

In the preparation of the Contract Documents, the following reports of explorations and tests of subsurface conditions at or contiguous to the Site of the Work were utilized:

Report dated July 27, 2023, prepared by Layne, a Granite Company; entitled Final Report of Findings Collector Well Feasibility Investigations and Vertical Well Assessment which may be reviewed at KC Water at 4800 East 63rd Street, Kansas City, Missouri. The technical data contained in such report upon which CONTRACTOR may rely is soil types, properties, and bearing capacities.

In the preparation of the Contract Documents, the following drawings of physical conditions in or relating to existing surface or subsurface structures (except Underground Facilities) which are at or contiguous to the Site of the Work were utilized:

1. Drawings dated 2009, prepared by Black & Veatch ; entitled Raw Water Piping, Valves, and Electrical Improvements which may be reviewed at KC Water at 4800 East 63rd Street, Kansas City, Missouri. The technical data contained in such drawings upon which CONTRACTOR may rely is contained on Sheets 1 through 36.

SC-4.06 Article 4, Paragraph 4.06, Asbestos, Lead-Based Paint, PCBs, Petroleum Waste or Radioactive Material, Subparagraphs A and B are supplemented as follows:

In the preparation of the Contract Documents, no reports of explorations and tests of any Hazardous Environmental Condition(s) at the Site of the Work have been prepared.

SC- 5.01 A. Article 5, Paragraph 5.01, Performance, Payment and Other Bonds, Subparagraph A, second sentence, is revised as follows:

These Bonds shall remain in effect at least until ***3 years*** after the date when final payment becomes due, except as provided otherwise by Laws or Regulations or by the Contract Documents.

SC-5.03 A. Article 5, Paragraph 5.03 Certificates of Insurance, Subparagraph A is amended by adding the following Subparagraph 1:

1. CONTRACTOR shall obtain evidence that all Subcontractors have in force the required coverage in the amounts required by these Contract Documents, and

evidence that each is current on its unemployment insurance payments before Subcontractors begin Work at the Site. CONTRACTOR shall retain such evidence in its files and make available to CITY within ten (10) days after written request.

SC-5.04 B.1. Article 5, Paragraph 5.04, CONTRACTOR's Liability Insurance, Subparagraph B.1 is amended as follows:

With respect to insurance required by Paragraphs 5.04 A.3 through 5.04 A.5, the following additional individuals or entities shall be listed as additional insureds:

a. Custom Engineering
12760 EAST 40 Highway
Independence, Missouri 64055

b. Black & Veatch Corporation
8880 Ward Parkway, Suite 400
Kansas City, Missouri 64114

With respect to Commercial Automobile Liability Insurance and Commercial General Liability Insurance, the Missouri Department of Transportation (MoDOT), the Missouri Highways and Transportation Commission (MHTC) and each of their respective employees shall be listed as additional insureds.

SC-5.04 C. Article 5, Paragraph 5.04, CONTRACTOR's Liability Insurance, Subparagraph C is amended as follows:

The following additional policies of insurance are required:

6. Environmental Liability Insurance. This insurance shall protect CONTRACTOR, and CITY, DESIGN PROFESSIONAL and Consultants as additional insureds, against claims for injuries to members of the public and damage to the property of others resulting from environmental impairment. The liability limits of the environmental policy shall not be less than $2,000,000.
7. Asbestos Liability Insurance. This insurance shall be an "occurrence" policy and shall protect CONTRACTOR, and CITY, DESIGN PROFESSIONAL and Consultants as additional insureds, against all claims arising from bodily injury, sickness, disease or death of any person other than the CONTRACTOR's employees arising out of any act related to asbestos abatement work. The liability limits for bodily injury and property damage shall be not less than:

   $1,000,000 each occurrence
   $2,000,000 general aggregate

If CONTRACTOR provides Environmental or Asbestos Liability Insurance through a Subcontractor, CONTRACTOR shall contractually require the Subcontractor to include CITY, Design Professional and Consultants as additional insureds in the Subcontractor's policy. CONTRACTOR shall deliver to CITY, prior to the start of any Work at the Project Site, properly

completed certificates of insurance or other evidence that the required insurance is in full force and effect, in a form acceptable to CITY. CONTRACTOR shall contractually require its Subcontractor to defend, indemnify and hold harmless CITY from and against all Claims arising out of or resulting from all acts or omissions in connection with this Contract caused in whole or in part by Subcontractor or Subcontractor's agents, regardless of whether or not caused in part by any act or omission, including negligence, of CITY. CONTRACTOR must provide evidence that this requirement has been complied in accordance with the provisions of Paragraphs 6.01 B and 6.06 G.

8. United States Long-shoremen's and Harbor Workers Compensation Insurance (USL&H).

SC-5.06 A. Article 5, Paragraph 5.06, Property Insurance, is amended by deleting Subparagraph A and inserting the following:

SC-5.06 A. Article 5, Paragraph 5.06, Property Insurance, Paragraph A, is amended by adding the following after the first sentence:

Property Insurance on the Work at the Site shall be written with a deductible amount not to exceed $10,000.00.

SC-6.06 A.1 Article 6, Paragraph 6.06 Substitutes and "Or-Equal" Items, Paragraph A is amended by adding the following at the end of Paragraph A.1:

Proposed "or-equal" items must be submitted to CITY at least eleven (11) days prior to Bid date at the following address:

Water Services Department
4800 East 63rd Street
Kansas City, Missouri 64130
Attn: Hamza Damer, Project Manager

Only Bidders may submit proposed "or-equal" items and such items must require no change in related Work. Acceptance by CITY of any proposed "or-equal" items will be made by Addendum only.

SC-6.06 A.2. Article 6, Paragraph 6.06 Substitutes and "Or-Equal" Items, Paragraph A is amended by adding the following at the end of Paragraph A.2:

Proposed substitute items must be submitted to CITY's Representative not later than eleven (11) days prior to the time the item is to be incorporated into the Work. Only CONTRACTOR may submit proposed substitute items, and such items must be submitted to CITY's Representative on the standard City form 01630 - Substitution Request. Acceptance by CITY of any proposed substitute item will be made by Change Order.

SC-6.07 J Article 6, Paragraph 6.07, concerning Subcontractors, Suppliers and Others, is supplemented by adding Subparagraph J as follows:

CONTRACTOR shall perform with its own organization Work amounting to not less than _30__% of the total Contract Price. “Its own organization” shall be construed to include only workers employed and paid by the CONTRACTOR and equipment owned or rented by the CONTRACTOR, with or without operators. Such term does not include employees or equipment of a subcontractor, assignee, or agent of the CONTRACTOR.

SC-6.09. Article 6, Paragraph 6.09, Permits, Subparagraph A is supplemented as follows:

CONTRACTOR does not need to obtain and pay for the following construction permits and licenses, which have been paid for by CITY:

MDNR Construction Permit
North Kansas City Levee District Permit

The Contractor will not be required to obtain a Kansas City, Missouri building permit for this project. They will, however, be required to call for trade and special inspections during construction.

SC-6.10. Article 6, Paragraph 6.10, Compliance with Laws and Regulations, is amended by adding the following new Subparagraphs immediately following Subparagraph 6.10 I 2:

a. CONTRACTOR will be required to comply with wage rates as follows:

County – Cass, Clay, Jackson, Platte or Ray

Work Type:	State –	Heavy
	State –	Building

SC-6.10. Article 6, Paragraph 6.10, Compliance with Laws and Regulations, is amended by adding the following new Subparagraph 6.10 S:

1. "Resident Laborers" means laborers who have been residents of the State of Missouri for at least thirty days and who intend to remain Missouri residents, and residents of Nonrestrictive States.

2. "Nonrestrictive States" means states identified by the Missouri Department of Labor and Industrial Relations Division of Labor Standards that have not enacted state laws restricting Missouri laborers from working on public works projects. A list of Nonrestrictive States can be found on the Division web site at http://www.dolir.mo.gov/ls/index.htm.

3. A period of Excessive Unemployment is declared when the Missouri Department of Labor and Industrial Relations Division of Labor Standards provides notice of such declaration. When in effect, notice will be provided on the Division web site at http://www.dolir.mo.gov/ls/index.htm. It is CONTRACTOR's obligation to determine whether a period of Excessive Unemployment is in effect when this Contract is let.

4. CONTRACTOR agrees to follow the provisions of Section 290.560 - 290.575 RSMo and agrees that if a period of Excessive Unemployment has been declared at any point during the term of this Contract, it will employ and require all Subcontractors of whatever tier to employ only Resident Laborers for the Work to be performed under this CONTRACT. Provided, however, CONTRACTOR may use laborers who are not Resident Laborers when Resident Laborers are not available or are incapable of performing the particular type of work involved if CONTRACTOR so certifies in writing to CITY and CITY issues a written approval. This provision does not apply to regularly employed nonresident executive, supervisory or technical employees.

Article 6, Paragraph 6.10, Compliance with Laws and Regulations, is amended by adding the following new Subparagraph 6.10 T:

Contract Information Management System. CONTRACTOR shall comply with CITY's Contract Information Management System requirements. CONTRACTOR shall use CITY's

Internet web based Contract Information Management System/Project Management Communications Tool provided by CITY and protocols included in that software during the term of this Contract. CONTRACTOR shall maintain user applications to CITY's provided system for all personnel, subcontractors or suppliers as applicable.

SC-6.11. Article 6, Paragraph 6.11, Taxes, is amended by adding the following sentence to Subparagraph 6.11 B:

A. Tax Compliance. The following subparagraphs apply if the Contract is over $150,000.00.

SC-9.08 E. Article 9, Paragraph 9.08, Limitations on DESIGN PROFESSIONAL's Authority and Responsibilities, Subparagraph E is supplemented as follows:

DESIGN PROFESSIONAL's Consultant(s), resident Project representative and assistant(s) to the resident Project representative are the following:

Consultant(s): Black & Veatch Corporation; Custom Engineering

Resident Project representative: ___

SC-12.01 Article 12, Paragraph 12.01, Time of the Essence is amended by adding the following new Subparagraphs immediately following Subparagraph 12.01 A:

B. Starting and Completion

1. The Work to be performed under this Contract shall begin on the date specified in the written Notice to Proceed issued by the Director of Water Services Department , and the Work shall be substantially complete, in accordance with Paragraph 14.04, within 760 Calendar Days thereafter. Once the Work starts, CONTRACTOR shall continuously pursue completion of the Work.
2. The Work shall be completed and ready for final payment in accordance with Paragraph 14.07 within 30 Calendar Days after the date of Substantial Completion of the Work.

B. Liquidated Damages

1. If the Work is not substantially completed, in accordance with Paragraph 14.04, within the period stated in Paragraph 12.01 B.1, CONTRACTOR shall pay to CITY the amount of ***one thousand*** ($ 1,000) as liquidated damages and not as a penalty for each Calendar Day until the Work is substantially complete. The amount of liquidated damages shall be deducted from any payments due or to become due CONTRACTOR.
2. If the Work is not completed and ready for final payment in accordance with Paragraph 14.07, within the period stated in Paragraph 12.01 B.2, CONTRACTOR shall pay to CITY the amount of ***three hundred*** ($ 300) as liquidated damages and not as a penalty for each Calendar Day until the Work is completed and ready for final payment. The amount of liquidated damages shall be deducted from any payments due or to become due CONTRACTOR.

D. Actual Damages.

If the Work is not completed within the Contract Times and, as a direct result, CITY incurs additional costs or loses revenues, then the amount of such additional costs and lost revenues, including but not limited to, costs for the completion, correction, replacement, or repair of the Work, lost rental income, costs of relocating tenants, costs of lease replacement or extension, any interest charges, fines or penalties imposed, and/or additional staff costs for administration, including legal costs, will be aggregated and assessed against CONTRACTOR. These and other such costs will compound and accrue until the completion of the Work and acceptance of the Work by CITY. CONTRACTOR shall pay actual damages to CITY in the amount of those additional costs and lost revenues.

SC-13.07 Article 13, Paragraph 13.07, Correction Period, Subparagraph A is amended as follows:

The correction period set forth in Paragraph 13.07 A shall be THREE (3) years instead of one (1) year, which longer period of time shall also be applicable to the correction period set forth in Paragraph 13.07 C. All other provisions of Paragraph 13.07 remain unchanged except as necessary to accommodate the revised length of the correction period.

SC-14.02 A. Article 14, Paragraph 14.02, Application for Progress Payments, Subparagraph A is amended by deleting Item 3 and adding the following:

3. CITY shall make payments to CONTRACTOR monthly on or about the 25TH day of each month. Payments to CONTRACTOR will be made on the basis of ninety-five percent (95%) of the value of the Work satisfactorily completed plus ninety-five percent (95%) of the value of properly stored and insured, unused materials on hand on the Site of the Work. CITY shall retain five percent (5%) of each partial payment until completion and acceptance of the Work covered by the Contract and final payment is due. All Work covered by a payment becomes CITY's property, provided that the Work paid for remains the sole responsibility of CONTRACTOR until all terms and conditions of the Contract have been met.

SC-14.04. Article 14, Paragraph 14.04, Substantial Completion, Subparagraph A is supplemented as follows:

A. To be considered substantially complete, the following items of the Work must be operational and ready for CITY's continuous use as intended:
   - Individual replacement vertical well developed, tested, and connected to the well collector pipe. Each well individual well have a separate substantial completion date.
   - Record Drawing Markups.

B. Portions of the Work not essential to plant operations, which may be completed without interruption of plant operation, may be completed after the Work is accepted as Achievement of Full Operation and include the following:
   - Seeding.
   - Project close-out documentation required by General Condition Article 14.07 A.2.

SC-14.05 Article 14, Paragraph 14.05, Partial Utilization is amended by adding the following new Subparagraph A.3. immediately following Subparagraph 14.05 A.2:

2. CITY at any time may make a written request to CONTRACTOR to permit CITY to take over operation of any part of the Work although it is not substantially complete. A copy of the request will be sent to DESIGN PROFESSIONAL, and within a reasonable time thereafter CITY, CONTRACTOR and DESIGN PROFESSIONAL shall make an inspection of that part of the Work to determine its status of completion and will prepare a list of the items remaining to be completed or corrected thereon before final payment. If CONTRACTOR does not make written objection to CITY and DESIGN PROFESSIONAL that such part of the Work is not ready for separate operation by CITY, DESIGN PROFESSIONAL will finalize the list of items to be completed or corrected and will deliver such lists to CITY and CONTRACTOR. DESIGN PROFESSIONAL will also make a written recommendation as to the division of responsibilities pending final payment between CITY and CONTRACTOR with respect to security, operation, safety, maintenance, utilities, insurance, warranties and guarantees for that part of the Work, which recommendation will become binding upon CITY and CONTRACTOR at the time when CITY takes over such operation (unless they shall have otherwise agreed in writing and so informed DESIGN PROFESSIONAL). During such operation and prior to Substantial Completion of such part of the Work, CITY shall allow CONTRACTOR reasonable access to complete or correct items on said list and to complete other related Work.
3. A Certificate of Achievement of Full Operation signed by the Design Professional for Partial Utilization for the Work in Accordance with Paragraph 14.5 of the Overflow Control Program General Conditions does not change the time when Performance, Payment, and Other bonds remain in effect as stated in Paragraph SC-5.01 A.

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SECTION 00830

PREVAILING WAGE

1. Annual Wage Order No. 32
2. **0830.03 Division of Labor Standards Rules & Regulations** are incorporated into and made part of this Contract and are available at http://s1.sos.mo.gov/cmsimages/adrules/csr/current/8csr/8c30-3.pdf.

Missouri
Division of Labor Standards
WAGE AND HOUR SECTION

MIKE KEHOE, Governor

Annual Wage Order No. 32

Section 019
CASS COUNTY

In accordance with Section 290.262 RSMo 2000, within thirty (30) days after a certified copy of this Annual Wage Order has been filed with the Secretary of State as indicated below, any person who may be affected by this Annual Wage Order may object by filing an objection in triplicate with the Labor and Industrial Relations Commission, P.O. Box 599, Jefferson City, MO 65102-0599. Such objections must set forth in writing the specific grounds of objection. Each objection shall certify that a copy has been furnished to the Division of Labor Standards, P.O. Box 449, Jefferson City, MO 65102-0449 pursuant to 8 CSR 20-5.010(1). A certified copy of the Annual Wage Order has been filed with the Secretary of State of Missouri.

Original Signed by
Logan Hobbs, Director
Division of Labor Standards

Filed With Secretary of State: **March 10, 2025**

Last Date Objections May Be Filed: **April 9, 2025**

Prepared by Missouri Department of Labor and Industrial Relations

Building Construction Rates for
CASS County

Section 019

OCCUPATIONAL TITLE	**Prevailing Hourly Rate
Asbestos Worker	$72.03
Boilermaker	$27.84*
Bricklayer-Stone Mason	$64.30
Carpenter	$67.36
Lather	
Linoleum Layer	
Millwright	
Pile Driver	
Cement Mason	$55.64
Plasterer	
Communication Technician	$27.84*
Electrician (Inside Wireman)	$75.11
Electrician Outside Lineman	$27.84*
Lineman Operator	
Lineman - Tree Trimmer	
Groundman	
Groundman - Tree Trimmer	
Elevator Constructor	$27.84*
Glazier	$27.84*
Ironworker	$71.27
Laborer	$52.18
General Laborer	
First Semi-Skilled	
Second Semi-Skilled	
Mason	$27.84*
Marble Mason	
Marble Finisher	
Terrazzo Worker	
Terrazzo Finisher	
Tile Setter	
Tile Finisher	
Operating Engineer	$62.27
Group I	
Group II	
Group III	
Group III-A	
Group IV	
Group V	
Painter	$27.84*
Plumber	$81.42
Pipe Fitter	
Roofer	$60.32
Sheet Metal Worker	$78.19
Sprinkler Fitter	$27.84*
Truck Driver	$27.84*
Truck Control Service Driver	
Group I	
Group II	
Group III	
Group IV	

*The Division of Labor Standards received fewer than 1,000 reportable hours for this occupational title. The public works contracting minimum wage is established for this occupational title using data provided by Missouri Economic Research and Information Center.
**The Prevailing Hourly Rate includes any applicable fringe benefit amounts for each occupational title as defined in RSMo Section 290.210.

Heavy Construction Rates for
CASS County

Section 019

OCCUPATIONAL TITLE	**Prevailing Hourly Rate
Carpenter	$64.46
Millwright	
Pile Driver	
Electrician (Outside Lineman)	$27.84*
Lineman Operator	
Lineman - Tree Trimmer	
Groundman	
Groundman - Tree Trimmer	
Laborer	$52.75
General Laborer	
Skilled Laborer	
Operating Engineer	$60.87
Group I	
Group II	
Group III	
Group IV	
Truck Driver	$52.95
Truck Control Service Driver	
Group I	
Group II	
Group III	
Group IV	

Use Heavy Construction Rates on Highway and Heavy construction in accordance with the classifications of construction work established in 8 CSR 30-3.040(3).

Use Building Construction Rates on Building construction in accordance with the classifications of construction work established in 8 CSR 30-3.040(2).

If a worker is performing work on a heavy construction project within an occupational title that is not listed on the Heavy Construction Rate Sheet, use the rate for that occupational title as shown on the Building Construction Rate Sheet.

*The Division of Labor Standards received fewer than 1,000 reportable hours for this occupational title. Public works contracting minimum wage is established for this occupational title using data provided by Missouri Economic Research and Information Center.

**The Prevailing Hourly Rate includes any applicable fringe benefit amounts for each occupational title.

OVERTIME
and
HOLIDAYS

OVERTIME

For all work performed on a Sunday or a holiday, not less than twice (2x) the prevailing hourly rate of wages for work of a similar character in the locality in which the work is performed or the public works contracting minimum wage, whichever is applicable, shall be paid to all workers employed by or on behalf of any public body engaged in the construction of public works, exclusive of maintenance work.

For all overtime work performed, not less than one and one-half (1½) the prevailing hourly rate of wages for work of a similar character in the locality in which the work is performed or the public works contracting minimum wage, whichever is applicable, shall be paid to all workers employed by or on behalf of any public body engaged in the construction of public works, exclusive of maintenance work or contractual obligation. For purposes of this subdivision, **"overtime work"** shall include work that exceeds ten hours in one day and work in excess of forty hours in one calendar week; and

A thirty-minute lunch period on each calendar day shall be allowed for each worker on a public works project, provided that such time shall not be considered as time worked.

HOLIDAYS

January first;
The last Monday in May;
July fourth;
The first Monday in September;
November eleventh;
The fourth Thursday in November; and
December twenty-fifth;

If any holiday falls on a Sunday, the following Monday shall be considered a holiday.

Missouri
Division of Labor Standards
WAGE AND HOUR SECTION

MIKE KEHOE, Governor

Annual Wage Order No. 32

Section 024
CLAY COUNTY

In accordance with Section 290.262 RSMo 2000, within thirty (30) days after a certified copy of this Annual Wage Order has been filed with the Secretary of State as indicated below, any person who may be affected by this Annual Wage Order may object by filing an objection in triplicate with the Labor and Industrial Relations Commission, P.O. Box 599, Jefferson City, MO 65102-0599. Such objections must set forth in writing the specific grounds of objection. Each objection shall certify that a copy has been furnished to the Division of Labor Standards, P.O. Box 449, Jefferson City, MO 65102-0449 pursuant to 8 CSR 20-5.010(1). A certified copy of the Annual Wage Order has been filed with the Secretary of State of Missouri.

Original Signed by
Logan Hobbs, Director
Division of Labor Standards

Filed With Secretary of State: **March 10, 2025**

Last Date Objections May Be Filed: **April 9, 2025**

Prepared by Missouri Department of Labor and Industrial Relations

OCCUPATIONAL TITLE	**Prevailing Hourly Rate
Asbestos Worker	$74.08
Boilermaker	$36.40*
Bricklayer-Stone Mason	$64.33
Carpenter	**$66.73**
Lather	
Linoleum Layer	
Millwright	
Pile Driver	
Cement Mason	$56.22
Plasterer	
Communication Technician	$63.19
Electrician (Inside Wireman)	$72.26
Electrician Outside Lineman	$93.51
Lineman Operator	
Lineman - Tree Trimmer	
Groundman	
Groundman - Tree Trimmer	
Elevator Constructor	$36.40*
Glazier	$59.01
Ironworker	$72.20
Laborer	$51.19
General Laborer	
First Semi-Skilled	
Second Semi-Skilled	
Mason	$57.19
Marble Mason	
Marble Finisher	
Terrazzo Worker	
Terrazzo Finisher	
Tile Setter	
Tile Finisher	
Operating Engineer	$66.56
Group I	
Group II	
Group III	
Group III-A	
Group IV	
Group V	
Painter	$36.40*
Plumber	$81.51
Pipe Fitter	
Roofer	$60.78
Sheet Metal Worker	$78.40
Sprinkler Fitter	$70.79
Truck Driver	$59.41
Truck Control Service Driver	
Group I	
Group II	
Group III	
Group IV	

*The Division of Labor Standards received fewer than 1,000 reportable hours for this occupational title. The public works contracting minimum wage is established for this occupational title using data provided by Missouri Economic Research and Information Center.
**The Prevailing Hourly Rate includes any applicable fringe benefit amounts for each occupational title as defined in RSMo Section 290.210.

Heavy Construction Rates for
CLAY County

Section 024

OCCUPATIONAL TITLE	**Prevailing Hourly Rate
Carpenter	$67.05
Millwright	
Pile Driver	
Electrician (Outside Lineman)	$93.51
Lineman Operator	
Lineman - Tree Trimmer	
Groundman	
Groundman - Tree Trimmer	
Laborer	$52.71
General Laborer	
Skilled Laborer	
Operating Engineer	$54.48
Group I	
Group II	
Group III	
Group IV	
Truck Driver	$52.62
Truck Control Service Driver	
Group I	
Group II	
Group III	
Group IV	

Use Heavy Construction Rates on Highway and Heavy construction in accordance with the classifications of construction work established in 8 CSR 30-3.040(3).

Use Building Construction Rates on Building construction in accordance with the classifications of construction work established in 8 CSR 30-3.040(2).

If a worker is performing work on a heavy construction project within an occupational title that is not listed on the Heavy Construction Rate Sheet, use the rate for that occupational title as shown on the Building Construction Rate Sheet.

*The Division of Labor Standards received fewer than 1,000 reportable hours for this occupational title. Public works contracting minimum wage is established for this occupational title using data provided by Missouri Economic Research and Information Center.

**The Prevailing Hourly Rate includes any applicable fringe benefit amounts for each occupational title.

OVERTIME
and
HOLIDAYS

OVERTIME

For all work performed on a Sunday or a holiday, not less than twice (2x) the prevailing hourly rate of wages for work of a similar character in the locality in which the work is performed or the public works contracting minimum wage, whichever is applicable, shall be paid to all workers employed by or on behalf of any public body engaged in the construction of public works, exclusive of maintenance work.

For all overtime work performed, not less than one and one-half (1½) the prevailing hourly rate of wages for work of a similar character in the locality in which the work is performed or the public works contracting minimum wage, whichever is applicable, shall be paid to all workers employed by or on behalf of any public body engaged in the construction of public works, exclusive of maintenance work or contractual obligation. For purposes of this subdivision, **"overtime work"** shall include work that exceeds ten hours in one day and work in excess of forty hours in one calendar week; and

A thirty-minute lunch period on each calendar day shall be allowed for each worker on a public works project, provided that such time shall not be considered as time worked.

HOLIDAYS

January first;
The last Monday in May;
July fourth;
The first Monday in September;
November eleventh;
The fourth Thursday in November; and
December twenty-fifth;

If any holiday falls on a Sunday, the following Monday shall be considered a holiday.

Missouri
Division of Labor Standards
WAGE AND HOUR SECTION

MIKE KEHOE, Governor

Annual Wage Order No. 32

Section 048
JACKSON COUNTY

In accordance with Section 290.262 RSMo 2000, within thirty (30) days after a certified copy of this Annual Wage Order has been filed with the Secretary of State as indicated below, any person who may be affected by this Annual Wage Order may object by filing an objection in triplicate with the Labor and Industrial Relations Commission, P.O. Box 599, Jefferson City, MO 65102-0599. Such objections must set forth in writing the specific grounds of objection. Each objection shall certify that a copy has been furnished to the Division of Labor Standards, P.O. Box 449, Jefferson City, MO 65102-0449 pursuant to 8 CSR 20-5.010(1). A certified copy of the Annual Wage Order has been filed with the Secretary of State of Missouri.

Original Signed by
Logan Hobbs, Director
Division of Labor Standards

Filed With Secretary of State: **March 10, 2025**

Last Date Objections May Be Filed: **April 9, 2025**

Prepared by Missouri Department of Labor and Industrial Relations

Building Construction Rates for
JACKSON County

Section 048

OCCUPATIONAL TITLE	**Prevailing Hourly Rate
Asbestos Worker	$72.10
Boilermaker	$40.77*
Bricklayer-Stone Mason	$64.45
Carpenter	$67.13
Lather	
Linoleum Layer	
Millwright	
Pile Driver	
Cement Mason	$56.83
Plasterer	
Communication Technician	$63.26
Electrician (Inside Wireman)	$74.98
Electrician Outside Lineman	$71.73
Lineman Operator	
Lineman - Tree Trimmer	
Groundman	
Groundman - Tree Trimmer	
Elevator Constructor	$96.07
Glazier	$59.60
Ironworker	$72.22
Laborer	$52.24
General Laborer	
First Semi-Skilled	
Second Semi-Skilled	
Mason	$54.18
Marble Mason	
Marble Finisher	
Terrazzo Worker	
Terrazzo Finisher	
Tile Setter	
Tile Finisher	
Operating Engineer	$66.32
Group I	
Group II	
Group III	
Group III-A	
Group IV	
Group V	
Painter	$40.77*
Plumber	$82.92
Pipe Fitter	
Roofer	$61.71
Sheet Metal Worker	$78.84
Sprinkler Fitter	$71.59
Truck Driver	$55.76
Truck Control Service Driver	
Group I	
Group II	
Group III	
Group IV	

*The Division of Labor Standards received fewer than 1,000 reportable hours for this occupational title. The public works contracting minimum wage is established for this occupational title using data provided by Missouri Economic Research and Information Center.
**The Prevailing Hourly Rate includes any applicable fringe benefit amounts for each occupational title as defined in RSMo Section 290.210.

Heavy Construction Rates for
JACKSON County

Section 048

OCCUPATIONAL TITLE	**Prevailing Hourly Rate
Carpenter	$67.20
Millwright	
Pile Driver	
Electrician (Outside Lineman)	$84.00
Lineman Operator	
Lineman - Tree Trimmer	
Groundman	
Groundman - Tree Trimmer	
Laborer	$53.06
General Laborer	
Skilled Laborer	
Operating Engineer	$61.77
Group I	
Group II	
Group III	
Group IV	
Truck Driver	$52.79
Truck Control Service Driver	
Group I	
Group II	
Group III	
Group IV	

Use Heavy Construction Rates on Highway and Heavy construction in accordance with the classifications of construction work established in 8 CSR 30-3.040(3).

Use Building Construction Rates on Building construction in accordance with the classifications of construction work established in 8 CSR 30-3.040(2).

If a worker is performing work on a heavy construction project within an occupational title that is not listed on the Heavy Construction Rate Sheet, use the rate for that occupational title as shown on the Building Construction Rate Sheet.

*The Division of Labor Standards received fewer than 1,000 reportable hours for this occupational title. Public works contracting minimum wage is established for this occupational title using data provided by Missouri Economic Research and Information Center.

**The Prevailing Hourly Rate includes any applicable fringe benefit amounts for each occupational title.

Missouri
Division of Labor Standards
WAGE AND HOUR SECTION

MIKE KEHOE, Governor

Annual Wage Order No. 32

Section 083
PLATTE COUNTY

In accordance with Section 290.262 RSMo 2000, within thirty (30) days after a certified copy of this Annual Wage Order has been filed with the Secretary of State as indicated below, any person who may be affected by this Annual Wage Order may object by filing an objection in triplicate with the Labor and Industrial Relations Commission, P.O. Box 599, Jefferson City, MO 65102-0599. Such objections must set forth in writing the specific grounds of objection. Each objection shall certify that a copy has been furnished to the Division of Labor Standards, P.O. Box 449, Jefferson City, MO 65102-0449 pursuant to 8 CSR 20-5.010(1). A certified copy of the Annual Wage Order has been filed with the Secretary of State of Missouri.

Original Signed by
Logan Hobbs, Director
Division of Labor Standards

Filed With Secretary of State: **March 10, 2025**

Last Date Objections May Be Filed: **April 9, 2025**

Prepared by Missouri Department of Labor and Industrial Relations

Building Construction Rates for
PLATTE County

Section 083

OCCUPATIONAL TITLE	**Prevailing Hourly Rate
Asbestos Worker	$71.19
Boilermaker	$34.28*
Bricklayer-Stone Mason	$64.62
Carpenter	$66.80
Lather	
Linoleum Layer	
Millwright	
Pile Driver	
Cement Mason	$57.71
Plasterer	
Communication Technician	$65.55
Electrician (Inside Wireman)	$75.86
Electrician Outside Lineman	$34.28*
Lineman Operator	
Lineman - Tree Trimmer	
Groundman	
Groundman - Tree Trimmer	
Elevator Constructor	$34.28*
Glazier	$34.28*
Ironworker	$71.57
Laborer	$50.93
General Laborer	
First Semi-Skilled	
Second Semi-Skilled	
Mason	$54.93
Marble Mason	
Marble Finisher	
Terrazzo Worker	
Terrazzo Finisher	
Tile Setter	
Tile Finisher	
Operating Engineer	$65.88
Group I	
Group II	
Group III	
Group III-A	
Group IV	
Group V	
Painter	$55.19
Plumber	$82.42
Pipe Fitter	
Roofer	$61.62
Sheet Metal Worker	$79.11
Sprinkler Fitter	$70.76
Truck Driver	$34.28*
Truck Control Service Driver	
Group I	
Group II	
Group III	
Group IV	

*The Division of Labor Standards received fewer than 1,000 reportable hours for this occupational title. The public works contracting minimum wage is established for this occupational title using data provided by Missouri Economic Research and Information Center.
**The Prevailing Hourly Rate includes any applicable fringe benefit amounts for each occupational title as defined in RSMo Section 290.210.

Heavy Construction Rates for
PLATTE County

Section 083

OCCUPATIONAL TITLE	**Prevailing Hourly Rate
Carpenter	$67.97
Millwright	
Pile Driver	
Electrician (Outside Lineman)	$34.28*
Lineman Operator	
Lineman - Tree Trimmer	
Groundman	
Groundman - Tree Trimmer	
Laborer	$52.48
General Laborer	
Skilled Laborer	
Operating Engineer	$61.20
Group I	
Group II	
Group III	
Group IV	
Truck Driver	$53.30
Truck Control Service Driver	
Group I	
Group II	
Group III	
Group IV	

Use Heavy Construction Rates on Highway and Heavy construction in accordance with the classifications of construction work established in 8 CSR 30-3.040(3).

Use Building Construction Rates on Building construction in accordance with the classifications of construction work established in 8 CSR 30-3.040(2).

If a worker is performing work on a heavy construction project within an occupational title that is not listed on the Heavy Construction Rate Sheet, use the rate for that occupational title as shown on the Building Construction Rate Sheet.

*The Division of Labor Standards received fewer than 1,000 reportable hours for this occupational title. Public works contracting minimum wage is established for this occupational title using data provided by Missouri Economic Research and Information Center.

**The Prevailing Hourly Rate includes any applicable fringe benefit amounts for each occupational title.

OVERTIME
and
HOLIDAYS

OVERTIME

For all work performed on a Sunday or a holiday, not less than twice (2x) the prevailing hourly rate of wages for work of a similar character in the locality in which the work is performed or the public works contracting minimum wage, whichever is applicable, shall be paid to all workers employed by or on behalf of any public body engaged in the construction of public works, exclusive of maintenance work.

For all overtime work performed, not less than one and one-half (1½) the prevailing hourly rate of wages for work of a similar character in the locality in which the work is performed or the public works contracting minimum wage, whichever is applicable, shall be paid to all workers employed by or on behalf of any public body engaged in the construction of public works, exclusive of maintenance work or contractual obligation. For purposes of this subdivision, **"overtime work"** shall include work that exceeds ten hours in one day and work in excess of forty hours in one calendar week; and

A thirty-minute lunch period on each calendar day shall be allowed for each worker on a public works project, provided that such time shall not be considered as time worked.

HOLIDAYS

January first;
The last Monday in May;
July fourth;
The first Monday in September;
November eleventh;
The fourth Thursday in November; and
December twenty-fifth;

If any holiday falls on a Sunday, the following Monday shall be considered a holiday.

Missouri
Division of Labor Standards
WAGE AND HOUR SECTION

MIKE KEHOE, Governor

Annual Wage Order No. 32

Section 089
RAY COUNTY

In accordance with Section 290.262 RSMo 2000, within thirty (30) days after a certified copy of this Annual Wage Order has been filed with the Secretary of State as indicated below, any person who may be affected by this Annual Wage Order may object by filing an objection in triplicate with the Labor and Industrial Relations Commission, P.O. Box 599, Jefferson City, MO 65102-0599. Such objections must set forth in writing the specific grounds of objection. Each objection shall certify that a copy has been furnished to the Division of Labor Standards, P.O. Box 449, Jefferson City, MO 65102-0449 pursuant to 8 CSR 20-5.010(1). A certified copy of the Annual Wage Order has been filed with the Secretary of State of Missouri.

Original Signed by
Logan Hobbs, Director
Division of Labor Standards

Filed With Secretary of State: **March 10, 2025**

Last Date Objections May Be Filed: **April 9, 2025**

Prepared by Missouri Department of Labor and Industrial Relations

Building Construction Rates for
RAY County

Section 089

OCCUPATIONAL TITLE	**Prevailing Hourly Rate
Asbestos Worker	$27.09*
Boilermaker	$27.09*
Bricklayer-Stone Mason	$27.09*
Carpenter	$66.96
Lather	
Linoleum Layer	
Millwright	
Pile Driver	
Cement Mason	$27.09*
Plasterer	
Communication Technician	$27.09*
Electrician (Inside Wireman)	$75.23
Electrician Outside Lineman	$27.09*
Lineman Operator	
Lineman - Tree Trimmer	
Groundman	
Groundman - Tree Trimmer	
Elevator Constructor	$27.09*
Glazier	$27.09*
Ironworker	$71.79
Laborer	$27.09*
General Laborer	
First Semi-Skilled	
Second Semi-Skilled	
Mason	$27.09*
Marble Mason	
Marble Finisher	
Terrazzo Worker	
Terrazzo Finisher	
Tile Setter	
Tile Finisher	
Operating Engineer	$27.09*
Group I	
Group II	
Group III	
Group III-A	
Group IV	
Group V	
Painter	$27.09*
Plumber	$82.87
Pipe Fitter	
Roofer	$27.09*
Sheet Metal Worker	$27.09*
Sprinkler Fitter	$27.09*
Truck Driver	$27.09*
Truck Control Service Driver	
Group I	
Group II	
Group III	
Group IV	

*The Division of Labor Standards received fewer than 1,000 reportable hours for this occupational title. The public works contracting minimum wage is established for this occupational title using data provided by Missouri Economic Research and Information Center.
**The Prevailing Hourly Rate includes any applicable fringe benefit amounts for each occupational title as defined in RSMo Section 290.210.

Heavy Construction Rates for
RAY County

Section 089

OCCUPATIONAL TITLE	**Prevailing Hourly Rate
Carpenter	$27.09*
Millwright	
Pile Driver	
Electrician (Outside Lineman)	$27.09*
Lineman Operator	
Lineman - Tree Trimmer	
Groundman	
Groundman - Tree Trimmer	
Laborer	$52.86
General Laborer	
Skilled Laborer	
Operating Engineer	$61.23
Group I	
Group II	
Group III	
Group IV	
Truck Driver	$27.09*
Truck Control Service Driver	
Group I	
Group II	
Group III	
Group IV	

Use Heavy Construction Rates on Highway and Heavy construction in accordance with the classifications of construction work established in 8 CSR 30-3.040(3).

Use Building Construction Rates on Building construction in accordance with the classifications of construction work established in 8 CSR 30-3.040(2).

If a worker is performing work on a heavy construction project within an occupational title that is not listed on the Heavy Construction Rate Sheet, use the rate for that occupational title as shown on the Building Construction Rate Sheet.

*The Division of Labor Standards received fewer than 1,000 reportable hours for this occupational title. Public works contracting minimum wage is established for this occupational title using data provided by Missouri Economic Research and Information Center.

**The Prevailing Hourly Rate includes any applicable fringe benefit amounts for each occupational title.

OVERTIME
and
HOLIDAYS

OVERTIME

For all work performed on a Sunday or a holiday, not less than twice (2x) the prevailing hourly rate of wages for work of a similar character in the locality in which the work is performed or the public works contracting minimum wage, whichever is applicable, shall be paid to all workers employed by or on behalf of any public body engaged in the construction of public works, exclusive of maintenance work.

For all overtime work performed, not less than one and one-half (1½) the prevailing hourly rate of wages for work of a similar character in the locality in which the work is performed or the public works contracting minimum wage, whichever is applicable, shall be paid to all workers employed by or on behalf of any public body engaged in the construction of public works, exclusive of maintenance work or contractual obligation. For purposes of this subdivision, **"overtime work"** shall include work that exceeds ten hours in one day and work in excess of forty hours in one calendar week; and

A thirty-minute lunch period on each calendar day shall be allowed for each worker on a public works project, provided that such time shall not be considered as time worked.

HOLIDAYS

January first;
The last Monday in May;
July fourth;
The first Monday in September;
November eleventh;
The fourth Thursday in November; and
December twenty-fifth;

If any holiday falls on a Sunday, the following Monday shall be considered a holiday.

CITY OF FOUNTAINS
HEART OF THE NATION
KANSAS CITY
MISSOURI

ADDENDUM NUMBER 1

Project Number 80002543/9911

Project Title Vertical Wells 2 - 5 Replacement

ISSUE DATE: **Jan 13, 2026**

Information to Bidders The following is provided to Bidders for information only:

1. Pre-Proposal sign-in sheet
2. Pre-Proposal presentation slides

Q1.	The pump specs are calling out for the submersible motors to be medium voltage (2.4K) however the smaller horsepower motors i.e. 50 and 75 hp are not manufactured in that voltage. They would only be available in 480 volt.
A1.	**Power supply for all pumps shall be 2400 volts.**
Q2.	The specs also want a PE to certify the mounting of the equipment. This is not possible since the wells are utilizing pitless adapters. There is no mounting involved when a pitless adapter is utilized.
A2.	**Anchor calculations and details do not need to sealed by a professional engineer. The requirement has been removed as a part of this addendum.**
Q3.	Plan Sheet VW-I-801 Control Block Diagram shows several different system PLCs, network devices and connections that are not identified in any other plan sheets or specification section including PLC-7 HCW-1, PLC-8 HCW-2, PLC-5 AB Transformer Level, PLC-9 Reservoir Gate Control Panel. Are these items indicated with dashed lines on the drawing all considered future equipment and connections only shown for reference?
A3.	**Other equipment is shown as a reference.**
Q4.	There is no Section 13590 Process Control Network Systems or Section 13591 Metallic and Fiber Optic Cable included in specification documents. Will these sections be included in an addendum?
A4.	**These sections have been added and are included in the attachment as a part of this addendum.**
Q5.	In section 02670 – Water Wells, 1.3 Submittals Item B, the requirement of having completed 5 projects with equal or greater diameters in the past 5 years will be very restrictive (in fact, I'm not sure anyone on the current plan holders list could meet that). I'm asking if you may consider waiving or modifying that requirement, and rather base the qualifications on experience with local geology and staff expertise.
A5.	**The past 5-year similar project requirement has been removed as a part of this addendum.**

Contracting Requirements

1. Under Division 1 – General Requirements, Section 01015 – PROJECT REQUIREMENTS, PART 1 – GENERAL, 1.22 NORTH KANSAS CITY LEVEE DISTRICT, ADD the following:

H. Contractor is required to obtain a Performance/Maintenance Bond or Deposit in accordance with Option #2 (Project Value) as described in the North Kansas City Levee District – Supplement B – Assurance Deposit Estimation Worksheet. Contractor cannot begin any work on site until the Bond has been paid to NKCLD.

2. Under Division 1 – General Requirement, Section 01015 – PROJECT REQUIREMENTS, PART 1 – GENERAL, ADD the following sections:

1.35 FAA Permitting
A. In accordance with the General Conditions, Article 6.09, Contractor shall submit an Obstruction Evaluation to the Federal Aviation Administration (FAA) for obtaining a permit for Contractor's construction equipment. Information for the Obstruction Evaluation and permitting process can be found on the FAA's website: https://www.faa.gov/air_traffic/obstruction_evaluation/. There is no cost associated with submitting the Obstruction Evaluation or obtaining the permit.

1.36 MDNR Permitting
A. Contractor shall complete a Pump Test Record and Pressure Grout Survey, as well as well certification form for each vertical well installed. These documents are to be submitted to the Missouri Geological Survey Well Installation Section for final construction approval.

Specifications

1. Division 1
   a. ADD the following sections attached to this addendum to the Project Manual:
      i. Section 01300 - Submittal Procedures
      ii. Section 01300.1 - F1 Submittal Identification and Contractor's Approval Statement
      iii. Section 01300.2 - F2 Submittal Identification and Contractor's Approval Statement
      iv. Section 01310 - Construction Progress Schedule
      v. Section 01310.1 - F1 Construction Progress Schedule
      vi. Section 01320 - Construction Progress Documentation
      vii. Section 01400 - Quality Control
      viii. Section 01410 - Regulatory Requirements
      ix. Section 01450 - Code Required Special Inspections and Procedures (IBC 2018)
      x. Section 01500 - Temporary Facilities and Controls
      xi. Section 01560 - Temporary Barriers Enclosures
      xii. Section 01610 - General Equipment Stipulations
      xiii. Section 01611.3 - Meteorological and Seismic Design Criteria (IBC 2018+2021)
      xiv. Section 01612 - Product Delivery Requirements
      xv. Section 01612.1 - Fig. 1 Export Shipment Packing Instructions
      xvi. Section 01612.2 - Fig. 2 Marking Instructions
      xvii. Section 01614 - Product Storage and Handling Requirements
      xviii. Section 01615 - Equipment and Valve Identification
      xix. Section 01650 - Commissioning
      xx. Section 01739 - Equipment Installation

2. Section 02670
   a. Paragraph 1.3.B. REMOVE "in the past 5 years"
   b. Paragraph 3.1 M. REMOVE "and other" and add "and other liquid" after "rotary" in the first and second paragraphs.
   c. Paragraph 3.1M. ADD the following sentence to the end of the paragraph "Contractor may propose alternative methods to the North Kansas City Levee District and US Army Corp of Engineer for approval for the protection of surficial fine-grain blanket material, such as hydrofracture calculations and underseepage analyses performed by a licensed engineer meeting the requirements of the USACE. Method of protection shall be approved by the USACE prior to mobilization."

3. Section 05550
   a. ADD Section 05550 Anchorage in Concrete and Masonry attached in this addendum to the Project Manual.

4. Section 11145
   a. Paragraph 1.3.A.1. Pumps. ADD "Size of pump column pipe".
   b. Paragraph 1.3 A.1. Complete Pump Unit. REMOVE "Anchorage calculations and details signed and sealed by a licensed Civil Engineer in the State of Missouri."

c. Paragraph 1.3.A.1. Complete Pump Unit. ADD “Data on shop painting”.

5. Division 13
   a. ADD Section 13590 Process Control Network Systems and 13591 Metallic and Fiber Optic Communication Cable and Connectors attached in this addendum to the Project Manual.

NOTE: Bidders must acknowledge receipt of this Addendum by listing the number and date, where provided, on the Bid Form - Document 00410.

Name	Contact info
Floyd Mitchem	816-500-0833 FloydMitchem55@gmail
Andrew Rieschick	402-801-1452 andrew@rieschickdrilling.com
Scott Williamson	williamsonts@bv.com
Ty Cooper	Ty.Cooper@ofcindustrial.com 816-260-8242
Dallas Massie	dallasm@pedrotti.com 913-956-9506
Brien Moylan	bmoylan@megaKC.com 913-593-1615
Kevin White	KC Water
Saurabh Kelkar	KC Water
Tim Smith	T.m.Smith@marlcore.com
David Elge	David.elge@kcmo.org

KCWATER

KCWATER

Vertical Wells 2-5 Replacement – Agenda
Project #: 80002543 Contract # 9911

- Introductions
- Bidder Instructions
- Project Information
- Final Reminders

Monday January 12th, 10:00am

Potential Bidders

Mandatory Pre-Proposal Meeting

Vertical Wells 2-5 Replacement – Project Team

KC Water

- **Project Manager:** Hamza Damer
- Phone Number: (816) 513-0219
- E-Mail: Hamza.Damer@kcmo.org

- **Interim Deputy Director:** David Poirier
- Phone Number: (816) 513-0217
- E-Mail: David.Poirier@kcmo.org

- **Section Head:** Kevin White
- Phone Number: (816) 513-0213
- E-Mail: Kevin.White@kcmo.org

- **Division Head:** Blake Anderson
- Phone Number: (816) 513-0329
- E-Mail: Blake.W.Anderson@kcmo.org

Vertical Wells 2-5 Replacement – Contract Admin

KC Water

Contract Administrator: Marzella Newman-Buckner

Phone Number: (816) 513-0319

E-Mail: Marzella.Newman-Buckner@kcmo.org

Civil Rights & Equal Opportunities Department (CREO)

- **CREO Approved Goals:** 11% MBE & 11% WBE

Bidder Instructions

Sealed Bids are Due Tuesday, February 3rd, 2026, by 2:00 PM

Technical Approach Submittal and Price Submittal to be in separate envelopes/packages.

Outside of each envelope/package must include:

Bidder's Name and Address

Project No. 80002543

Invitation For Bid – Technical Approach Submittal for Project No. 80002543

Deliver to:

Marzella Newman-Buckner, Senior Procurement Officer at Water Services
4800 E. 63rd Kansas City,
Kansas City, MO 64130

Project Overview Information

Project Overview

- The project aims to replace outdated infrastructure, enhance pumping capacity, and ensure the long-term reliability and efficiency of the water supply system.
- 4 new vertical collection wells to improve water capture
- removal of existing wells and vaults to make space for new infrastructure
- installation of new 36-inch diameter water supply wells and high efficiency pumps to increase pumping capacity



Project Overview

- The project will upgrade the system's instrumentation to improve monitoring and control, and it will include the installation of a new electrical duct bank to support the increased power requirements of the new infrastructure.
- This comprehensive upgrade will modernize the water supply system, improve operational efficiency, and ensure a reliable water source for the community.



Vertical Wells 2-5 Replacement



Final Reminder

Due Dates:

- Question Due Date: January 27th, 2026
- Sealed Bids Due Date: February 3rd, 2026, by 2:00pm

Deliver to:

Marzella Newman-Buckner, Senior Procurement Officer at Water Services
4800 E. 63rd Kansas City, MO 64130

Thank You

SECTION 01300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SHOP DRAWINGS AND ENGINEERING DATA.

A. General.

1. The Project has been designed by Engineer and Engineer will perform design-intent reviews of submittals. Owner, Engineer, and Contractor may develop a protocol for the transmittal of shop drawings, samples, and other submittals.

2. Shop Drawings and engineering data (submittals) covering all equipment and all fabricated components and building materials which will become a permanent part of the Work under this Contract shall be submitted to Engineer for review, as required. Submittals shall verify compliance with the Contract Documents, and shall include drawings and descriptive information in sufficient detail to show the kind, size, arrangement, and the operation of component materials and devices; the external connections, anchorages, and supports required; the performance characteristics; and dimensions needed for installation and correlation with other materials and equipment.

3. Each submittal shall cover items from only one section of the specification unless the item consists of components from several sources. Contractor shall submit a complete initial submittal including all components. When an item consists of components from several sources, Contractor's initial submittal shall be complete including all components.

4. All submittals, regardless of origin, shall be approved by Contractor and clearly identified with the name and number of this Contract, Contractor's name, and references to applicable specification paragraphs and Contract Drawings. Each copy of all submittals, regardless of origin, shall be stamped or affixed with an approval statement of Contractor. Each submittal shall indicate the intended use of the item in the Work. When catalog pages are submitted, applicable items shall be clearly identified and inapplicable data crossed out. The current revision, issue number, and date shall be indicated on all drawings and other descriptive data.

5. Contractor shall be solely responsible for the completeness of each submittal. Contractor's stamp or affixed approval statement of a submittal, per Figure 1-01300, is a representation to Owner Engineer that Contractor accepts sole responsibility for determining and verifying all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto, and that Contractor has reviewed and coordinated each submittal with other Shop Drawings and with the requirements of the Work and the Contract Documents.

6. All deviations from the requirements of the Contract Documents shall be identified as deviations on each submittal and shall be tabulated in Contractor's letter of transmittal using Figure 2-01300. Such submittals shall, as pertinent to the deviation, indicate essential details of all changes proposed by Contractor (including modifications to other facilities that may be a result of the deviation) and all required piping and wiring diagrams.

7. Contractor shall submit shop drawings electronically.

8. For electronic submittals, drawings and the necessary data shall be submitted electronically to Engineer as specified below. Submittal documents shall be in color to facilitate use of red line markups.

    a. All electronic files shall be in Portable Document Format (PDF) as generated by Adobe Acrobat Professional Version 7.0, Bluebeam Revu Version 20.2, or higher.
    b. The PDF file(s) shall be fully indexed using the Table of Contents, searchable with thumbnails generated. PDF images must be at a readable resolution.
    c. For most documents, they should be scanned or generated at 300 dots per inch (dpi). Use of higher resolution is acceptable with Owner and Engineer approval.
    d. Optical Character Recognition (OCR) capture must be performed on these images so that text can be searched, selected and copied from the generated PDF file.
    e. The PDF documents shall have a bookmark created in the navigation frame for each major entry (“Section” or “Chapter”) in the Table of Contents.
    f. Thumbnails shall be generated for each page or graphic in the PDF file.
    g. The opening view for each PDF document shall be as follows:
        1) Initial View: Bookmarks and Page
        2) Magnification: Fit In Window
        3) The file shall open to Contractor’s transmittal letter, with bookmarks to the left. The first bookmark shall be linked to the Table of Contents.

    h. PDF document properties shall include the submittal number for the document title and Contractor’s name for the author.
    i. Electronic submittal file sizes shall be limited to 50 MB. When multiple files are required for a submittal the least number of files possible shall be created.

9. Contractor shall post submittals and retrieve Engineer's submittal review comments through the Project website accessible through the Internet. Instruction on procedures for posting and retrieving submittals will be provided after award of the Contract.

10. Facsimiles (fax) will not be acceptable. Submittals will not be accepted from anyone but Contractor. Submittals shall be consecutively numbered in direct sequence of submittal and without division by subcontracts or trades.

B. Engineer's Review of Submittals.

1. Engineer's review of submittals covers only general conformity to the Drawings and Specifications, external connections, and dimensions that affect the layout; it does not indicate thorough review of all dimensions, quantities, and details of the material, equipment, device, or item covered. Engineer's review shall not relieve Contractor of sole responsibility for errors, omissions, or deviations in the drawings and data, nor of Contractor's sole responsibility for compliance with the Contract Documents.

2. Engineer's submittal review period shall be 28 consecutive calendar days and shall commence on the first calendar day following receipt of the submittal or resubmittal in Engineer's office.

3. The time required to mail the submittal or resubmittal back to Contractor shall not be considered a part of the submittal review period.

4. When the drawings and data are returned with review status "NOT ACCEPTABLE" or "RETURNED FOR CORRECTION", the corrections shall be made as instructed by Engineer.

   a. If submittals are made electronically, the corrected drawings and data shall be resubmitted through the Project website.
   b. Resubmittals by facsimile or e-mail will not be accepted. When the drawings and data are returned with review status "EXCEPTIONS NOTED", "NO EXCEPTIONS NOTED", or "RECORD COPY", no additional copies need be furnished unless specifically requested by Engineer, except as required for the Final Shop Drawing Submittal Package specified in Paragraph D.

C. Resubmittal of Shop Drawings and Data.

1. Contractor shall accept full responsibility for the completeness of each resubmittal. Contractor shall verify that all corrected data and additional information previously requested by Engineer are provided on the resubmittal. Resubmittals shall be in an organized and consistent format and shall be provided as a complete submittal, including portions that may have been previously approved.

2. When corrected copies are resubmitted, Contractor shall direct specific attention to all revisions in writing and shall list separately any revisions made other than those called for by Engineer on previous submittals. Written response to

Engineer's review comments shall be provided with each resubmittal. Requirements specified for initial submittals shall also apply to resubmittals. Resubmittals shall bear the number of the first submittal followed by a letter (A, B, etc.) or a unique identification that indicates the initial submittal and correct sequence of each resubmittal.

3. If more than one resubmittal is required because of failure of Contractor to provide all previously requested corrected data or additional information, Contractor shall reimburse Owner for the charges of Engineer for review of the additional resubmittals. This does not include initial submittal data such as shop tests and field tests that are submitted after initial submittal.

4. Resubmittals shall be made within 60 days of the date of the letter returning the material to be modified or corrected, unless within 30 days Contractor submits an acceptable request for an extension of the stipulated time period, listing the reasons the resubmittal cannot be completed within that time.

5. The need for more than one resubmittal, or any other delay in obtaining Engineer's review of submittals, will not entitle Contractor to extension of the Contract Times unless delay of the Work is the direct result of a change in the Work authorized by a Change Order or failure of Engineer to review and return any submittal to Contractor within the specified review period.

1.2 Final Shop Drawings Submittal Package

A. Prior to Substantial completion to the project, Contractor shall submit to Engineer for review a compiled electronic file of all shop drawings which have been revied to incorporate all of Engineer's review comments, including those comments noted on submittals that were previously returned as "EXCEPTIONS NOTED." All incorrect or inapplicable data shall be removed from the Final Shop Drawing Submittal Package.

B. The electronic copy shall be submitted through the Project website. After review by Engineer is complete, one final hard copy of the final Shop Drawing Submittal Package shall be prepared and delivered to the Owner. An electronic copy of the final Shop Drawing Submittal Package shall be provided directly to the Owner via file transfer and a copy shall be uploaded to the Project website. The electronic copy shall be formatted similar to the requirements specified for electronic Operation and Maintenance Manuals, including a Table of Contacts, bookmarks, and search function.

1.3 OPERATION AND MAINTENANCE DATA AND MANUALS.

A. Refer to section 01021 – Operation Maintenance Data for O&M submission requirements.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

End of Section

SUBMITTAL No. _____
SECTION

_____

Do not combine multiple sections together unless required by specifications.

(Contractor's Letterhead)

SUBMITTAL IDENTIFICATION & CONTRACTOR'S APPROVAL STATEMENT

DATE: _____ COPIES _____ DRAWING SHEET NO._____

Description submittal contents:

_____

Location:

_____

Manufacturer_____

_____

Subcontractor or Supplier (Optional)

_____

REMARKS:

_____

_____

_____

_____

_____

CONTRACTOR'S APPROVAL

(Construction Company) has reviewed and coordinated the submitted documentation and verifies that the equipment and material meet the requirements of the Work and the Contract Documents. We accept sole responsibility for determining and verifying all quantities, dimensions, field construction criteria, materials, catalog numbers, and similar data contained in the submittal as required by the Contract Documents.

Deviations: □ None □ Yes (See attached Figure 2-01300 for written description)

Approved By: _____ Date: _____

This approval does not release subcontractor / vendor from the contractual responsibilities.

SUBMITTAL No. _____
SECTION

_____

Do not combine multiple sections together unless required by specifications.

(Contractor's Letterhead)

SUBMITTAL IDENTIFICATION & CONTRACTOR'S APPROVAL STATEMENT

DATE: _____ COPIES _____ DRAWING SHEET NO._____

Description submittal contents:

_____

Location:

_____

Manufacturer_____

_____

Subcontractor or Supplier (Optional)

_____

DEVIATIONS

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SECTION 01310 - CONSTRUCTION PROGRESS SCHEDULE

PART 1 - GENERAL

1.1 GENERAL OVERVIEW.

A. A Progress Schedule shall be used to control the Work and to provide a definitive basis for determining project progress. The Progress Schedule shall be prepared, maintained and updated by Contractor and historical dates agreed monthly with Engineer. Contractor shall submit a preliminary Progress Schedule and a Progress Schedule for acceptance by Engineer. These schedules shall be Contractor's working schedules and shall be used to plan, organize and execute the Work, record and report actual performance and progress, and show how Contractor plans to complete all remaining Work as of the end of each progress report period.

B. The Progress Schedule shall comprise all the detailed construction-related activities using the critical path method (CPM). The Progress Schedule shall provide sufficient detail and clarity to reflect the intricacies and interdependencies of activities so Contractor can plan, schedule, monitor, control and report on the progress of his work. In addition, it shall provide Engineer and Owner a tool to monitor and follow the progress for all phases of the Work.

1.2 PRE-CONSTRUCTION SCHEDULING CONFERENCE.

A. Not used.

1.3 PRELIMINARY PROGRESS SCHEDULE.

A. Following the pre-construction scheduling conference but within ten calendar days after the Effective Date of the Contract, Contractor shall submit a preliminary Progress Schedule for review by Engineer. The preliminary Progress Schedule shall show detailed construction-related activities for the first 30 days of the project. The remainder of the Contract activities shall be shown as summary bars within the milestones of the Work. If Engineer has comments on the preliminary Progress Schedule, Contractor shall make the necessary changes and resubmit it within ten calendar days. No progress payments will be made during the period specified above for the preliminary Progress Schedule until the preliminary Progress Schedule has been accepted by Engineer.

B. The preliminary Progress Schedule shall:

1. Illustrate a feasible schedule for completion of the Work within the Contract Times and Milestones specified.

2. Provide an elementary example of the schedule in the format to be used for the Progress Schedule.

3. Include the activity code structure as described in Paragraph 19 of this specification.

C. Preliminary Progress Schedule Submittal Format:

1. Contractor shall submit two compact disks of the preliminary Progress Schedule. Compact disks shall be read-write and enable the use of the schedule as an executable file as described herein.

2. A brief narrative shall accompany the submittal, describing Contractor's scheduling approach to the project. The narrative shall include a description of the Contract milestones, approach for construction activities during the period of the preliminary Progress Schedule, description of the general approach of the activities for the work beyond the preliminary Progress Schedule period, a description of the project's critical path, identification of critical long-lead submittals, and planned outages.

3. The narrative shall also incorporate activity codes, calendars, weather days, milestone constraints, and work breakdown structure in accordance with the requirements specified herein.

1.4 PROGRESS SCHEDULE.

A. The Progress Schedule comprises all the construction-related activities for the Work and shall show the order in which Contractor proposes to carry out the work. Contractor shall include milestones, coordination necessitated by limited access and available work areas, and the availability and use of manpower, material and equipment. Contractor shall use the Progress Schedule to plan, schedule and coordinate the Work including activities of subcontractors, equipment vendors, and suppliers.

B. The Progress Schedule shall be to the level of detail acceptable to Engineer, and shall include the following:

1. Organization and structural breakdown of the Project;

2. Milestones and completion dates;

3. Type of work to be performed and the labor trades involved;

4. Purchase, manufacture and delivery activities for major materials and equipment;

5. Preparation, submittal, and acceptance of shop drawings and material samples;

6. Deliveries of owner-furnished equipment and/or materials;

7. Acceptances required by regulatory agencies and/or other third parties;

8. Assignment of responsibility for each activity;

9. Access requirements to work areas;

10. Identification of interfaces and dependencies with preceding, concurrent and follow-on contractors;

11. Tests, submittal of test reports and acceptance of test results;

12. Planning for phased or total acceptance by Owner; including start up and commissioning;

13. Identification of any manpower, material and equipment restrictions.

14. Sequence of construction to maintain plant operations;

15. Planned outages.

C. The activities included in the Progress Schedule shall be defined in work days. Durations shall be based on the labor (crafts), equipment, and materials required to perform each activity on a normal workday basis. Activity durations shall be 20 working days or less except in the case of non-construction activities such as procurement of materials, delivery of equipment, and concrete curing. All durations shall be the result of definitive manpower and resource planning by Contractor to perform the Work, in consideration of contractually defined on-site work conditions and Contractor's planned means and methods.

D. When the Progress Schedule is accepted by Engineer, Engineer will save a copy of the Progress Schedule as the baseline schedule, and will use it for analysis of Contractor's progress.

E. Contractor shall update the Progress Schedule monthly.

1.5 ELECTRONIC PROGRESS SCHEDULE FORMAT AND REPORTING.

A. The Progress Schedule shall be created using MS Project or Primavera P6 scheduling software. Contractor shall submit an electronic PDF formatted copy of the Progress Schedule.Contractor shall use Engineer's file-naming format throughout the project.

1.6 COST-LOADING.

A. Except for manufacturer lead-time, each Progress Schedule activity that has an actual cost shall have a cost value assigned to it. Equipment or material delivery activities bearing cost shall be separate activities. Each activity's assigned cost shall consist of all costs associated with that activity including all project management, superintendence, overhead and profit costs. The sum of all activity costs shall be equal to the current Contract Price at all times, including approved change orders. Contractor shall certify

that the costs are not unbalanced and that the value assigned to each activity represents Contractor's total cost to perform that activity.

B. If Engineer or Owner determines cost data does not meet the requirements for a balanced bid breakdown, Contractor shall submit documentation substantiating any cost allocation questioned. Cost allocations will be considered unbalanced if activity on the Progress Schedule has been assigned a disproportionate allocation of direct costs, overhead and profit. If documentation of the cost data does not, in the opinion of Engineer substantiate cost allocations, the Progress Schedule will be returned to Contractor for action.

C. Contractor shall produce Cash Flow Projection reports and graphics from the MS Project or Primavera P6 application.

D. Cost-loaded data shall be the basis for monthly payment applications and shall be included with monthly updates of the Progress Schedule.

1.7 RESOURCE-LOADING.

A. Contractor shall build a resource (manpower) library within MS Project or Primavera P6 and assign resources to each applicable Progress Schedule activity. Resource-loading shall determine the activity duration based on the assigned resource. Contractor shall submit a resource analysis report produced from MS Project or Primavera P6 in the form of a series of graphics showing the principal trades. The report shall show the number of man-days of effort for each month over the life of the Contract. The manpower requirements forecast shall be updated monthly and shall include the actual manpower used by trade as of the current report period and the manpower required to complete the Work.

1.8 COORDINATING PROGRESS SCHEDULE WITH OTHER CONTRACT SCHEDULES.

A. Not used.

1.9 SUBMITTALS.

A. Progress Schedule Submittals

1. The Progress Schedule and associated reports shall be submitted to Engineer for acceptance within the period of the preliminary Progress Schedule specified herein. If the Progress Schedule is not submitted, no progress payments will be made after the due date until the Progress Schedule has been submitted.

2. Printouts and electronic layouts required as part of the Progress Schedule submittal and monthly updates are as follows:

a. Summary Schedule: one page milestone and summary schedule, sorted by total Float, early-start, early-finish;
b. Detailed Project Schedule: organized by Work Breakdown Structure (WBS) or area of work; sorted by total Float, early-start, early-finish;
c. Critical Path Schedule: sorted based on the total Float, early-start, early-finish;
d. 60-Day Look Ahead Schedule: sorted by total Float, early-start, early-finish;
e. Activities in Progress: organized by WBS or area of work; sorted by total Float, early-start, early-finish;

3. Contractor shall submit additional layouts if directed by Engineer.

4. The submittal shall include the following:

a. Narrative report summarizing the milestones, critical path, project approach including phasing or use of crews, significant submittal and fabrication items, coordination or interface requirements, Owner-provided items, and list of subcontractors and vendors.
b. Graphic reports including critical path report (longest path), summary schedule report, total Float report by early-start early-finish, look-ahead report grouped by work breakdown structure or project phasing, and cash flow projection. Cash flow projections include estimated cumulative cost curves based on early and late start dates and projection of monthly payments over the life of the project

5. The schedule, critical path, and look-ahead schedules shall be submitted on 11”x14” size paper

6. The Progress Schedule file shall be submitted in an executable format, using MS Project or Primavera Project Manager (P6) format on an electronic PDF formatted copy.

7. The narrative and graphic reports shall be provided on 8”x11” paper and 11”x17” size paper respectively.

1.10 MONTHLY SCHEDULE UPDATES.

A. Monthly Progress Schedule updates shall be submitted for the duration of the Contract on a date agreed to by Owner, Engineer, and Contractor. If monthly Progress Schedule updates are not submitted by the due date, progress payments will be withheld until the required information is submitted.

B. The updated schedule shall be reviewed each month in a meeting with Engineer to verify:

1. Actual start dates,

2. Actual completion dates,

3. Activity percent completion,

4. Revised logic (as-built and projected) and changes in activity durations, cost assigned,

5. Cost influence of change orders, if any,

6. Revisions due to extension of time.

C. Prior to each meeting, Contractor shall prepare a complete and accurate report of current procurement and construction progress through the end of the update period, and a depiction of how Contractor plans to continue the Work to meet all contract completion dates. All network changes and status data agreed to during each update meeting shall be considered as accepted by both parties unless written notice of any exceptions is given within five calendar days after the meeting.

D. For major network changes that cannot be agreed to during an updating meeting, Contractor shall submit the proposed changes for Engineer's acceptance prior to inserting such changes into the network. Submittals may be in the form of marked-up networks, fragnets, or schedule abstracts, provided they are submitted with a letter of transmittal. A fragnet is defined as a sequence of new activities and/or activity revisions that are proposed to be added to the existing schedule to demonstrate how project events have an impact on the schedule.

1.11 DATA DATE.

A. The data date is the re-settable date in MS Project or P6 that serves as the end of a reporting period. The reporting period will be recorded on a monthly basis, e.g., January 1st through January 31st with the 31st as the data date. If required for coordination purposes by Owner, Engineer will provide specific data dates to be used by Contractor.

1.12 REVIEW PROCESS.

A. Engineer will review Contractor's preliminary Progress Schedule and full Progress Schedule submittals within 15 calendar days after receipt of all required information.

B. At the request of Owner or Engineer, Contractor shall participate in any meetings necessary to reach a mutual agreement and acceptance of the preliminary Progress Schedule, Progress Schedules, or Cash Flow Projections.

C. If any of the required submittals are returned to Contractor for corrections or revisions, they shall be resubmitted within ten calendar days after the return mailing date. Resubmittals shall include all information and media included in the first submittal. Review and response by Engineer will be given within 10 calendar days after receipt of each resubmittal.

D. Schedules shall show contract completion of the Work on the Contract completion date and with zero or positive total Float even if Contractor plans to finish early. In no event shall acceptance of the Progress Schedule be a basis for a claim for delay against Owner or Engineer by Contractor for an early finish. A Progress Schedule containing activities with negative Float or that extend beyond the date that the Work is completed and ready for final payment will not be acceptable.

E. Acceptance of the Progress Schedule by Engineer does not relieve Contractor of responsibility for accomplishing the Work by the Contract completion date. Omissions and errors in the accepted Progress Schedule shall not relieve Contractor of obligations under the Contract. Acceptance by Engineer in no way makes Engineer or Owner an ensurer of the Progress Schedule's success or liable for time or cost overruns. Engineer and Owner hereby disclaim any obligation or liability by reason of acceptance of the Progress Schedule by Engineer.

1.13 RESPONSIBILITY FOR SCHEDULE COMPLIANCE.

A. Whenever it becomes apparent from the current Progress Schedule that the critical path is delayed and the contract completion date will not be met, Contractor shall mitigate the delay by taking some or all of the following actions at no additional cost to Owner.

1. Increase construction manpower in such quantities and crafts as will bring the project back on schedule within the completion dates and milestones.

2. Increase the number of working hours per shift, shifts per day, working days per week, and the amount of construction equipment, or any combination of the foregoing, to substantially eliminate the backlog of work.

3. Re-schedule activities to achieve maximum practical concurrence of activities and to comply with the schedule date(s).

B. Within ten calendar days of Engineer’s request, Contractor shall submit a recovery schedule and written statement of the steps intended to remove or arrest the delay to the critical path in the schedule. If Contractor fails to submit the required information or should fail to take measures acceptable to Engineer, Engineer with Owner concurrence may direct Contractor to increase man-power, equipment and scheduled work hours to remove or arrest the delay to the critical path and Contractor shall promptly provide such level of effort at no additional cost to Owner.

C. In the event Contractor fails to follow the updated or revised recovery schedule, Owner may elect to withhold progress payments until Contractor complies with the revised schedule.

D. Should Contractor’s efforts not remove or arrest the delay to the critical path of the accepted schedule, then Owner shall be entitled to supplement Contractor’s work-force and equipment to remove and arrest any delay, and shall be entitled to deduct all costs and expenses associated therewith from payments due to Contractor. If insufficient Contract funds remain, Owner may recover such funds from Contractor and its Surety.

1.14 CHANGES IN THE WORK, DELAYS, AND EXTENSIONS OF TIME.

A. When changes in the Work or delays are experienced by Contractor and Contractor requests an extension of time, Contractor shall submit a written time impact analysis to Engineer illustrating the influence of each change or delay to the current Contract Times. Each time impact analysis shall include a fragnet incorporating the change or delay into the Progress Schedule to demonstrate how Contractor was delayed.

B. Each time impact analysis shall demonstrate the estimated time impact based on the events of the change or the delay; the date the change was given to Contractor or the delay incurred, the status of construction at that point in time, and the event time computation of all activities affected by the change or delay. The event times used in the analysis shall be those included in the latest update of the Progress Schedule or as adjusted for the events of delay.

C. Three copies of the time impact analysis and an electronic copy on compact disk shall be submitted within seven calendar days of delay occurrence or direction to proceed with a change is given to Contractor. No time extensions will be considered if the time impact analysis is not submitted within the specified time.

D. Engineer will review Contractor's time impact analysis. Contractor shall furnish such justification and supporting evidence as Engineer deems necessary to determine whether Contractor is entitled to an extension of time. Engineer's review of each time impact analysis will be made within five working days of receipt of the time impact analysis and additional information as required by Engineer, unless subsequent meetings and negotiations are necessary.

E. The Contract Times will be adjusted only for causes specified in paragraph 15. Time extensions will be granted only to the extent that equitable time adjustments for the activity or activities affected exceed the total or remaining Float along the critical path at the time of actual delay. Delays in activities which are not on the critical path and do not affect Contract Times, will not be considered for an extension of time.

1.15 CAUSES FOR EXTENSIONS OF TIME.

A. Additional positive total Float in the Progress Schedule generated by efficiencies of Owner or Contractor is a shared commodity to be reasonably used by either party, and belongs exclusively to the Project. Contractor is not entitled to any additional compensation for completion of the project prior to expiration of the Contract Times.

B. Owner-Initiated Changes. Owner initiated changes to the Work that absorb Float time will not be considered for an extension of time. Owner-initiated changes that affect the critical path of the Progress Schedule shall be grounds for extending or shortening completion dates. Use of Float time for Contractor initiated changes will require Owner's concurrence. Contractor's changes, however, shall give way to Owner-initiated changes competing for the same Float time.

C. Outside Contractor's Control. Events outside of Contractor's control that affect the critical path of the Progress Schedule will be considered for an extension or reduction of the Contract Times.

D. Weather Delays. Engineer will obtain weather data during construction from a reputable source, and will maintain weather records.

1. Engineer will determine Contractor's entitlement to an extension of the Contract Times as a result of weather delays, based on the flow chart in Figure 1-01310and the data included in Tables 1, 2 and 3 . Extensions of time will be granted at the discretion of Engineer for circumstances not covered by the flow chart.

2. Any weather-related extension of Contract Times shall be non-compensable. Efficiencies gained as a result of favorable weather within a calendar month, where the number of days of normally anticipated weather days is less than expected, shall contribute to the project Float and shall not affect the Contract Times.

3. Application for a weather related extension of time shall be submitted to Engineer, using form 1-01310**,** and shall state the extension requested and be supported by the relevant weather data.

4. Contractor shall include the number of days, for each calendar period, from Tables 2 and 3 in the Project Schedule. Days shall be labeled as Extreme Weather Float. Extreme Weather Conditions that affect the Critical Path of the Progress Schedule, in excess of the Extreme Weather Float, will be considered for an extension or reduction of the Contract Times. Notification for all extreme weather related events must be submitted no later than 72 hours after the weather impact date.

Table 1

Average Monthly Precipitation

(inches)

10 year average **2014 - 2024**

NOAA National Centers fro Environmental Information, Annual Climatological Summaries

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0.91	0.51	2.00	2.57	5.81	3.46	4.86	4.64	2.20	3.15	1.22	1.15

Table 2

Average Number of Calendar Days

with Precipitation of 0.25 Inches

or More in a Single 24-hour Period

10 year average **2014 - 2024**

NOAA National Centers fro Environmental Information, Annual Climatological Summaries

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2	2	4	4	7	5	5	5	4	4	2	2

Table 3

Average Number of Calendar Days

with Temperature greater than 90 °F

10 year average **2014 - 2024 NOAA National Centers fro Environmental Information, Annual Climatological Summaries**

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	0	0	0	2	14	17	13	7	1	0	0

5. Table 3 includes historical weather data for the average number of days recorded where temperature could be considered extreme. Not every day listed in Table 3 will result in an Extreme Weather Condition. A subsequent determination shall be done based on the Heat Index Apparent Temperature or Wind Chill Index.

6. Justification for an extension or reduction of the Contract Times as a result of extreme temperature shall be determined based on the Heat Index Apparent Temperature or Wind Chill Index using formulas below. The Heat Index and Wind Chill Temperature limits for determining the extreme temperature event shall be those listed in Figure 1-01 32 16.

    a. Heat Index:

$$HI = -42.379 + 2.04901523 \times T + 10.14333127 \times RH - 0.22475541 \times T \times RH - 0.00683783 \times T \times T - 0.05481717 \times RH \times RH + 0.00122874 \times T \times T \times RH + 0.00085282 \times T \times RH \times RH - 0.00000199 \times T \times T \times RH \times RH$$

Where:
HI = Heat Index Expressed as an Apparent Temperature in Degrees Fahrenheit (°F)
T = Average Day Temperature in Degrees Fahrenheit (°F)
RH = Average Day Relative Humidity in Percent (%)

If the RH is less than 13% and the temperature is between 80 and 112 degrees Fahrenheit (°F), then the following adjustment is subtracted from HI:

ADJUSTMENT = [(13 - RH)/4] x SQRT{[17 - ABS(T - 95)]/17}

Where:
HI = Heat Index Expressed as an Apparent Temperature in Degrees Fahrenheit (°F)
T = Average Day Temperature in Degrees Fahrenheit (°F)
RH = Average Day Relative Humidity in Percent (%)
SQRT = Square Root Function

If the RH is greater than 85% and the temperature is between 80 and 87 degrees Fahrenheit (°F), then the following adjustment is added to HI:

ADJUSTMENT = [(RH - 85)/10] x [(87 - T)/5]

Where:
HI = Heat Index Expressed as an Apparent Temperature in Degrees Fahrenheit (°F)
T = Average Day Temperature in Degrees Fahrenheit (°F)
RH = Average Day Relative Humidity in Percent (%)

b. Wind Chill Index:

$$WC = 35.74 + 0.6215 \times T - 35.75 \times V^{0.16} + 0.4275 \times T \times V^{0.16}$$

Where:
WC = Wind Chill Index Expressed as a Temperature in Degrees Fahrenheit (°F)
T = Average Day Temperature in Degrees Fahrenheit (°F)
V = Wind Speed in Miles per Hour (mph)

1.16 AS-BUILT SCHEDULE.

A. As a condition precedent to release of final payment, the last update to the Progress Schedule submitted shall be identified by Contractor as the “As-Built Schedule”. The “As-Built Schedule” shall reflect the exact manner in which the project was actually constructed (including actual start and completion dates, activities, sequences, and logic) and shall be signed and certified by Contractor’s project manager.

1.17 SCHEDULING SOFTWARE APPLICATION.

A. Scheduling software shall be MS Project or Primavera Project Manager (P6) without exception.

1.18 SCHEDULE SOFTWARE SETTINGS AND RESTRICTIONS

A. Contractor shall consult with Engineer for acceptable MS Project or Primavera Project Manager software settings and restrictions. The following shall apply unless otherwise directed by Engineer.

1. Schedule Options:

   a. Shall be defined only to “Use expected finish dates”;
   b. Scheduling progressed activities to be set to “Use only retained logic”, not progress override option;
   c. Critical Path activities defined as total Float less than or equal to zero;
   d. Calculating start-to-start lag from “early start” dates; and computing total Float as “finish Float = late finish – early finish”;
   e. alendar to be set for scheduling relationship lag as “Predecessor Activity Calendar.”

2. Activity progress shall be shown using Remaining Duration. Date format shall be DDMMYY.

3. Default activity type shall be set to “Independent Task”.

4. Date/time activity constraint(s), other than those required by the Contract, will not be allowed unless accepted by Engineer. Contractor shall identify proposed constraints and explain the constraint purpose in the Narrative Report.

5. Lags shall not be used in the creation of an activity that will perform the same function, e.g., concrete cure time. Lag durations contained in the Progress Schedule shall not have a negative value. Contractor shall identify any lag proposed and explain the purpose of the lag in the Narrative Report.

6. Actual Start and Finish dates shall not be automatically updated by default mechanism that may be included in the CPM scheduling software system. Actual Start and Actual Finish dates on the CPM schedule shall be updated by actual work progression.

1.19 ACTIVITY CODES.

A. The MS Project or Primavera (P6) activity codes and work breakdown structure (WBS) to be confirmed or revised by Engineer are listed below. Confirmation or revision of the activity codes and WBS will be provided to Contractor within three workdays of the

Effective Date of the Contract. Use of Engineer prescribed activity codes and WBS is mandatory.

B. "Project Codes" as defined by Primavera P6 is reserved for Owner. Only "Activity Codes" at Project Level will be permitted for Contractor use.

Activity Code	Code Value	Description
Phase	0005	Construction Phase
Construction Phase	A	Milestones
	BC	Administrative
	D	Submittals
	E	Construction Activities
		Closeout Phase
Submittals	SUB	Submittals
	R&A	Review & Approve
	F&D	Fabricate & Deliver

Other Codes to be prescribed by Engineer or requested by Contractor for project specific criteria.

1.20 ACTIVITY RELATIONSHIPS

A. Relationships between activities shall be identified with the following information:

1. Predecessor and successor activity ID.

2. Relationship types:

   a. FS - Finish to start
   b. SS - Start to start
   c. FF - Finish to finish
   d. SF - Start to finish – This relationship is not allowed, unless authorized by Engineer.

1.21 PROJECT CALENDARS

A. Project Calendars shall use workdays and calendar days as the planning unit for the schedule. Use of Global Calendars is reserved for Owner. Each calendar shall be set to start on Mondays with holidays in accordance with Owner policy. The following calendars shall be used for each activity except as otherwise accepted by Engineer:

1. 5-Day x 8 Hour Workweek (with holidays) shall be used for 5-day 40-hour workweek activities: Monday through Friday. All holidays and non-work days shall be assigned to this calendar. This calendar shall be used for all normal work activities, submittals, and fabricate and delivery activities. This calendar shall be the default calendar for the project unless otherwise specified.

2. 5-Day x 10-Hour Workweek (with holidays) shall be used for 5-day 50-hour workweek activities: Monday through Friday. All holidays and non-work days shall be assigned to this calendar.

3. 6-Day x 10-Hour Workweek (with holidays) shall be used for 6-day 60-hour workweek activities. Monday through Saturday. All holiday and non-work days shall be assigned to this calendar.

4. 7-Day Calendar (no holidays) shall be used for 7-day workweek activities. No non-work days shall be entered into this calendar.

5. Additional Calendars may be assigned depending on need. However, Contractor shall consult with Engineer before other calendars are entered and/or used in the Progress Schedule.

B. The work day to calendar day correlation shall be based on a single shift and 5-day work week with adequate allowance for holidays, adverse weather and all other special requirements of the Work. Contractor may, at his option, propose alternate baseline calendars to allow a second shift and/or a single shift on Saturdays subject to the concurrence and acceptance of Owner. Under no circumstances will a schedule be accepted which allows regularly scheduled work on Sundays.

C. The holidays observed by Owner are as follows:

1. New Year’s Day
2. Martin Luther King, Jr. Day
3. President’s Day
4. Memorial Day
5. Juneteenth
6. July 4th
7. Labor Day
8. Veterans Day
9. Thanksgiving Day

10. Friday following Thanksgiving
11. Christmas Day

1.22 FLOAT

A. Contractor shall not use Float suppression techniques, including preferential sequencing (arranging critical path through activities more susceptible to Owner caused delay); lag logic restraints; zero total or free Float constraints; extended activity times; or imposing constraint dates other than as required by the Contract. Float suppression will be cause for rejection of the preliminary Progress Schedule or full Progress Schedule and its updates.

1.23 MANDATORY MILESTONES

A. The Contract duration shall be equal to the time period between the Notice to Proceed and the completion of the Work in readiness for final payment. The following milestones are mandatory.

1. Notice to Proceed
2. Milestones, if any, as indicated in Contractor's Bid
3. Substantial Completion as indicated in Contractor's Bid
4. Completion and readiness for final payment, as indicated in Contractor's Bid

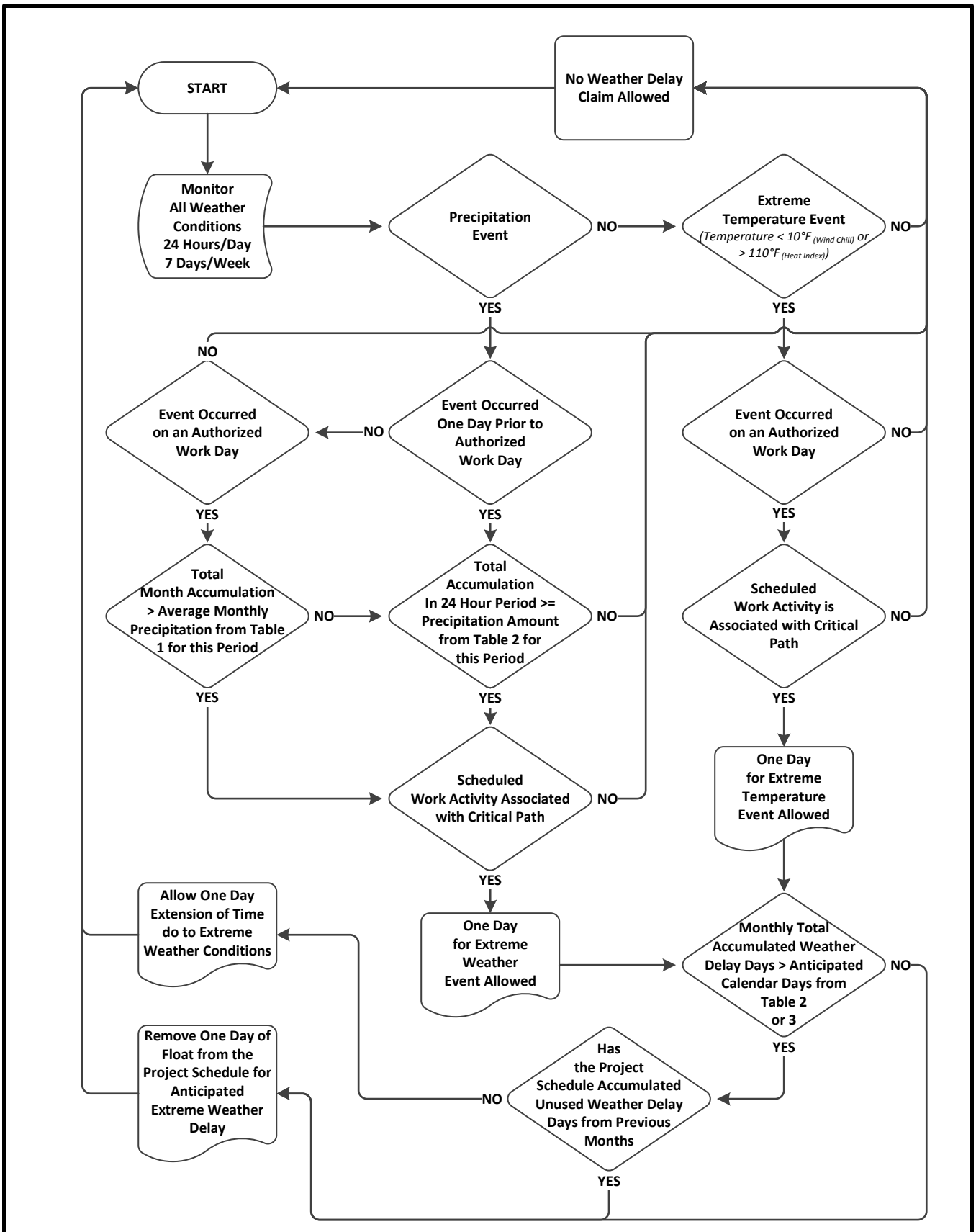
B. The following additional milestones are to be considered and incorporated into the Progress Schedule in accordance with the Contract, if applicable.

1. Permit constraints
2. Facility shut down or outage milestone requirements
3. Applicable phasing milestones
4. Other milestones deemed appropriate by Engineer

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

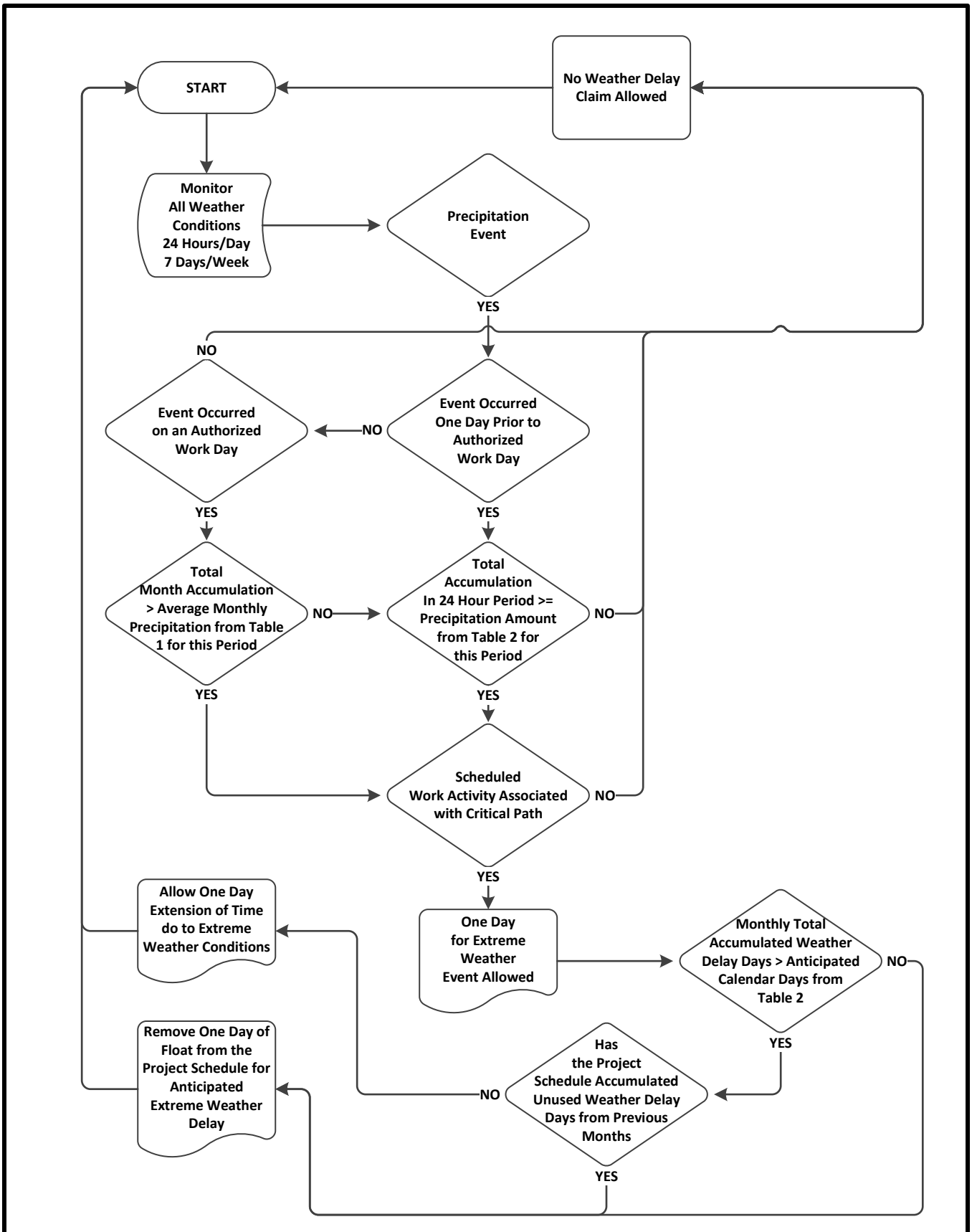
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EXTREME WEATHER EVENT DELAY CLAIM DECISION MAKING FLOW CHART

BLACK & VEATCH	*CONSTRUCTION PROGRESS SCHEDULE*	*FIGURE 01310-01*

Revision 1/30/2019



EXTREME WEATHER EVENT DELAY CLAIM DECISION MAKING FLOW CHART

BLACK & VEATCH	*CONSTRUCTION PROGRESS SCHEDULE*	*FIGURE 01310-02*

SECTION 01320 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 General

A. Units of Measurement. When both inch-pound (English) and SI (metric) units of measurement are specified herein, the values expressed in inch-pound units shall govern.

1.2 SCHEDULE OF VALUES.

A. After review of the preliminary schedule at the preconstruction conference, and at least 15 days before submission of the first Application for Payment, Contractor shall prepare and submit to Engineer a Schedule of Values covering each lump sum item. The Schedule of Values, showing the value of each kind of work, shall be acceptable to Engineer before any Application for Payment is prepared.

B. The sum of the items listed in the Schedule of Values shall equal the Contract Price. Such items as Bond premium, temporary construction facilities, and plant may be listed separately in the Schedule of Values, provided the amounts can be substantiated. Overhead and profit shall not be listed as separate items.

C. The Schedule of Values shall have sufficient detail such that partial completion of separable items of work can easily be calculated. The Schedule of Values shall have separate lines for manufacturer's field services, O&M manuals, and performance testing for each item of equipment requiring such services.

D. An unbalanced Schedule of Values providing for overpayment of Contractor on items of Work which would be performed first will not be accepted. The Schedule of Values shall be revised and resubmitted until acceptable to Engineer. Final acceptance by Engineer shall indicate only consent to the Schedule of Values as a basis for preparation of applications for progress payments, and shall not constitute an agreement as to the value of each indicated item.

1.3 SCHEDULE OF PAYMENTS

A. Within 30 days after award of contract, Contractor shall furnish to Engineer a schedule of estimated monthly payments. The schedule shall be revised and resubmitted each time an Application for Payment varies more than 10 percent from the estimated payment schedule.

1.4 SURVEY DATA.

A. All field books, notes, and other data developed by Contractor in performing surveys required as part of the Work shall be available to Engineer for examination throughout the construction period. All such data shall be submitted to Engineer with the other documentation required for final acceptance of the Work.

1.5 LAYOUT DATA.

A. Contractor shall keep neat and legible notes of measurements and calculations made in connection with the layout of the Work. Copies of such data shall be furnished to the Resident Project Representative for use in checking Contractor's layout as provided in the project requirements section. All such data considered of value to Owner will be transmitted to Owner by Engineer with other records upon completion of the Work.

End of Section

SECTION 01400 - QUALITY CONTROL

PART 1 - GENERAL

1.1 TESTING SERVICES.

A. Testing services shall be provided in accordance with Paragraph 14.02 of the General Conditions. All tests to determine compliance with the Contract Documents shall be performed by an independent commercial testing firm acceptable to Engineer and/or Authority Having Jurisdiction excluding testing as specified to be conducted directly by Contractor. The testing firm's laboratory shall be staffed with experienced technicians, properly equipped and fully qualified to perform the tests in accordance with the specified standards.

B. Testing services provided by Owner are for the sole benefit of Owner and/or as required by the governing building code; however, test results shall be available to Contractor. Testing necessary to satisfy Contractor's internal quality control procedures shall be the sole responsibility of Contractor.

C. Testing Services Provided by Contractor.

1. Unless otherwise specified, Contractor shall provide all testing services in connection with the following:

a. Any Work or part thereof specifically to be inspected, tested or approved by an employee or representative of an Authority Having Jurisdiction. Contractor shall assume full responsibility for arranging and obtaining such inspections, tests or approvals. Contractor shall pay all costs associated for these activities and shall provide the required certificates of inspection or approval.

b. Any inspections, tests or approvals required for Owner or Engineer acceptance of materials or equipment to be incorporated in the Work. This includes any items required for acceptance of materials, concrete mix designs or equipment submitted for approval prior to Contractor’s purchase for incorporation in the Work.

c. Testing, adjusting and balancing of mechanical, electrical and other equipment and systems as specified to be incorporated into the Work. This includes services required by manufacturers of equipment or other products such as concrete repair products, pipe, coatings, linings and roof membranes furnished under the Contract Documents.

d. Any Work (or part thereof) required by the Contract Documents to be approved by Owner, Engineer or other designated individual or entity. Contractor shall assume full responsibility for arranging and obtaining such approvals, pay all costs in connection therewith and submit to Engineer the required certificates of approval.

2. Excluding those conducted directly by an Authority Having Jurisdiction or expressly specified to be conducted directly by Contractor, inspections and tests shall be performed by independent inspectors, approved agencies or other qualified individuals or entities acceptable to Owner and Engineer .

D. Testing Services and Special Inspections Provided by Owner.

1. Unless otherwise specified, Owner shall employ and pay for the services of an independent testing laboratory, approved agency or other qualified individual or entities for inspections, tests or approvals required by the Contract Documents for field quality control. These include items indicated as Owner provided in the following specifications:

a. Structural Tests and Special Inspections
b. Excavation and Fill for Structures
c. Trenching and Backfilling
d. Cleaning and Disinfection of Water Pipelines
e. Grouting
f. Structural and Miscellaneous Metals
g. Other materials and equipment at the discretion of Owner.

E. Contractor shall provide access to the site and Work in accordance with the Contract Documents. Contractor shall give timely notice of the readiness of the Work for inspection, tests or approvals and shall cooperate with the inspection and testing personnel to facilitate the required tests and inspections. Contractor shall furnish all sample materials and cooperate in the testing activities, including sampling. Contractor shall interrupt the Work when necessary to allow testing, including sampling, to be performed. Contractor shall have no Claim for an increase in Contract Price or Contract Times due to such interruption. When testing activities, including sampling, are performed in the field by Engineer or Agency personnel, Contractor shall furnish personnel and facilities to assist in the activities as required.

F. Transmittal of Test Reports.

1. Written reports of tests and engineering data furnished by Contractor for Engineer's review of materials and equipment proposed to be used in the Work shall be submitted as specified for Shop Drawings.

2. The Approved Agency retained by Owner will furnish electroniccopies of a written report of each test. Two copies of each test report will be transmitted to the Resident Project Representative, one copy to the Special Inspector, one copy to Engineer, and one copy to Contractor, within 3 days after each test is completed or as directed by the Statement of Special Inspections as applicable.

1.2 OFFSITE INSPECTION

A. Inspection of materials or equipment during the production, manufacturing, or fabricating process, or before shipment, will be preformed by an independent testing firm or Approved Agency acceptable to Engineer and Authority Having Jurisdiction as

specified in the materials and equipment sections or Structural Tests and Specials Inspections section.

B. Except as otherwise specified in other section, Contractor shall give appropriate written notice to Engineer not less than 10 days before offsite inspection services are required, and shall provide for the producer, manufacturer, or fabricator to furnish safe access and proper facilities and to cooperate with inspecting personnel in the performance of their duties.

C. The inspection organization will submit a written report to Engineer, with a copy to Contractor, at least once each week or as directed by the Statement of Special Inspections as applicable.

1.3 MANUFACTURER'S FIELD SERVICES

A. Manufacturer’s field services shall be as specified herein except as specifically specified in the respective equipment sections.

B. Services Furnished Under This Contract. An experienced, competent, and authorized representative of the manufacturer of each item of equipment for which field services are indicated in the respective equipment section or in the equipment schedule section shall visit the Site of the Work and inspect, check, adjust if necessary, and approve the equipment installation. In each case, the manufacturer's representative shall be present when the equipment is placed in operation. The manufacturer's representative shall revisit the jobsite as often as necessary until all trouble is corrected and the equipment installation and operation are satisfactory in the opinion of Engineer.

C. Each manufacturer's representative shall furnish to Owner, through Engineer, a written report certifying that the equipment has been properly installed and lubricated; is in accurate alignment; is free from any undue stress imposed by connecting piping or anchor bolts; and has been operated under full load conditions and that it operated satisfactorily.

D. All costs for these services shall be included in the Contract Price.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

End of Section

SECTION 01410 – REGULATORY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes: Regulatory authorities and codes. Any costs associated with code compliance with the Kansas City, Missouri Codes Department are the responsibility of the CONTRACTOR.

1.2 AUTHORITIES HAVING JURISDICTION

A. Building Department: City of Kansas City, Missouri.

1.3 APPLICABLE CODES

A. International Code Council (ICC).

1. Building code:

a. International Building Code (IBC), 2018.
1) With City of Kansas City, Missouri amendments.

b. International Existing Building Code (IEBC), 2018.

2. With City of Kansas City, Missouri amendments Electrical code:

a. National Fire Protection Association (NFPA), NFPA 70: National Electrical Code (NEC), 2017.
1) With City of Kansas City, Missouri amendments.

3. Energy code:

a. International Energy Conservation Code (IECC), 2021.
1) With City of Kansas City, Missouri amendments.

4. Fire code:

a. International Fire Code (IFC), 2018.
1) With City of Kansas City, Missouri amendments.

5. Fuel gas code:

a. International Fuel Gas Code (IFGC) – 2018.
1) With City of Kansas City, Missouri amendments.

6. Mechanical code:

    a. International Mechanical Code (IMC), 2018.
        1) With City of Kansas City, Missouri amendments.

7. Plumbing code:

    a. Uniform Plumbing Code (UPC2018).
        1) With City of Kansas City, Missouri amendments.

8. National Fire Protection Association (NFPA)

    a. Chemical Storage
        1) 400 – Hazardous Materials Code

    b. Wastewater facilities
        1) 820 – Standard for Fire Protection in Wastewater Facilities

9. Missouri Department of Natural Resources (MDNR)

10. American Water Works Association (AWWA)

B. North Kansas City Levee District (NKCLD)

C. Utilities operated by utility agencies other than the Owner.

D. Maintain electrical, telephone, water, gas, sanitary facilities, and other utilities within existing facilities in service. Provide temporary utilities when necessary.

E. New yard utilities were designed using existing facility drawings.

1. Field verification of utilities locations was not performed during design.

2. Services crossed or located nearby new yard utilities may require relocation and possible shutdowns.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED

End of Section

SECTION 01450 - CODE REQUIRED SPECIAL INSPECTIONS AND PROCEDURES (IBC 2018)

PART 1 - GENERAL

1.1 SCOPE

A. Owner, or Registered Design Professional in Responsible Charge of construction acting as Owner's Agent, will engage one or more Approved Agencies to conduct tests and special inspections specified in this section and other related sections, and as specified in other sections of these specifications.

B. The Approved Agency shall not be employed by Contractor or a supplier materially participating in the project.

1.2 GENERAL

A. This section includes administrative and procedural requirements indicated in the governing building code.

B. Structural testing and special inspection services are required to verify compliance with the construction documents and standards referenced herein. These services do not relieve Contractor of responsibility for compliance with the construction documents.

C. Specific quality-assurance and quality-control requirements for individual construction activities are also referenced in other sections. Requirements in those sections may also cover production of standard products.

D. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and quality-control procedures that facilitate compliance with the construction documents.

E. Requirements for Contractor to provide quality-assurance and quality-control services required by Engineer, Owner, or Authority Having Jurisdiction (AHJ) are not limited by provisions of this section.

1.3 DEFINITIONS.

A. Approved Agency: An established and recognized agency regularly engaged in conducting tests, furnishing inspection services, or furnishing product certification when such agency has been approved by the Authority Having Jurisdiction.

B. Approved Fabricator: An established and qualified person, firm or corporation approved by the Authority Having Jurisdiction to perform work without Special Inspection.

C.

D. Authority Having Jurisdiction (AHJ): The officer or other designated authority charged with the administration and enforcement of the building code, or a duly authorized representative. Also commonly known as the Building Official.

E. Construction Documents: Written, graphic and pictorial documents prepared or assembled for describing the design, location and physical characteristics of the elements of a project necessary for obtaining a building permit. Construction documents include all supplemental instructions, sketches, addenda, and revisions to the drawings and specifications issued by the Registered Design Professional beyond those issued for a building permit.

F. Pre-Engineered Structural Elements: Structural elements specified by the Registered Design Professional but which may be designed by another Registered Design Professional. (Examples are items such as open web steel joists and joist girders, metal joists, pre-cast concrete elements, pre-fabricated metal buildings, pre-stressed wire wrapped tanks, tilt-up concrete panel reinforcement and lifting hardware.)

G. Registered Design Professional (RDP): An individual who is registered or licensed to practice their respective design profession as defined by the statutory requirements of the professional registration laws of the state or jurisdiction in which the project is to be constructed.

H. Registered Design Professional in Responsible Charge (RDPRC): A Registered Design Professional engaged by Owner to review and coordinate certain aspects of the project, as determined by the AHJ and Construction Documents, for compatibility with the design of the buildings or structure, including submittal documents prepared by others, deferred submittal documents and phased submittal documents.

I. Shop Drawings / Submittal Data: Written, graphic and pictorial documents prepared and / or assembled by Contractor or Supplier based on the Construction Documents.

J. Special Inspection: Inspection and/or testing required by the governing building code, as amended by the AHJ, of the materials, installation, fabrication, erection or placement of components and connections requiring special expertise to ensure compliance with approved Construction Documents and referenced standards.

K. Special Inspection, Continuous: The full-time observation or testing of work requiring special inspection by an approved Special Inspector who is present in the area where the work is being performed.

L. Special Inspection, Periodic: The part-time or intermittent observation or testing of work requiring Special Inspection by an approved Special Inspector who is present in the area where the work has been or is being performed and at the completion of the work.

M. Special Inspector: A qualified person demonstrating competence, to the satisfaction of the AHJ and RDPRC, for inspection of the particular type of construction or operation requiring special inspection. The Special Inspector will be qualified as specified herein.

N. Testing Agency: A qualified materials testing laboratory under the responsible charge of a Registered Design Professional, approved by the AHJ and the RDPRC, to measure, examine, test, calibrate, or otherwise determine the characteristics or performance of construction materials and verify confirmation with construction documents.

1.4 INSPECTION AND TESTING AGENCY QUALIFICATIONS.

A. Special Inspectors and testing agencies will be employed or retained by Owner, and will have the minimum qualifications as described in this section. The qualifications of all personnel performing special inspection and testing activities are subject to the approval of the AHJ and RDPRC.

B. Minimum qualifications of inspection and testing agencies and their personnel will comply with ASTM E329 "Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection," or IAS AC 291 "Accreditation Criteria for Special Inspection Agencies."

C. Inspectors and individuals performing tests will be certified for the work being performed as listed below and in Table 1 of IAS AC291, or by alternate certifications when acceptable to the AHJ. The AHJ may have additional requirements.

Abbreviation used in this Section	Description
AIA	Architect licensed in the state of the project, specializing in the design of building structures.
Licensed Engineers	
PE/SE	Structural Engineer (SE) or Professional Engineer (PE) licensed in the state of the project, specializing in the design of building structures.
PE/GE	Geotechnical Engineer (GE) or Professional Engineer (PE) licensed in the state of the project, specializing in soil mechanics and foundations.
PE/EE	Electrical Engineer (EE) or Professional Engineer (PE) licensed in the state of the project, specializing in electrical systems.
PE/ME	Mechanical Engineer (ME) or Professional Engineer (PE) licensed in the state of the project, specializing in mechanical systems.
EI/EIT	Engineering Intern or Engineer-in-Training: a graduate engineer who has passed the Fundamentals of Engineering examination working under the direct supervision of a Professional Engineer licensed in the state of the project and with a minimum of one year of experience performing inspections.

Abbreviation used in this Section	Description
American Concrete Institute (ACI) Certification	
ACI-CFTT	Concrete Field Testing Technician – Grade 1.
ACI-CCI	Concrete Construction Inspector.
ACI-LTT	Laboratory Testing Technician – Grade 1 or 2.
ACI-STT	Strength Testing Technician.
American Welding Society (AWS) Certification	
AWS-CWI	Certified Welding Inspector.
AWS/AISC-SSI	Certified Structural Steel Inspector.
American Society of Non-Destructive Testing (ASNT) Certification	
ASNT	Non-Destructive Testing Technician. For Ultrasonic Testing (UT) and Radiographic Testing (RT) Certified as Level III through examination by ASNT or certified as Level II by their employer for flaw detection. For Magnetic Particle Testing (MT) and Liquid Penetrant Testing (PT) certified as Level II by their employer or certified as Level III through examination by ASNT and certified by their employer.
International Code Council (ICC) Certification	
ICC-SMSI	Structural Masonry Special Inspector.
ICC-SWSI	Structural Steel and Welding Special Inspector.
ICC-SFSI	Spray-Applied Fire-proofing Special Inspector.
ICC-PCSI	Prestressed Concrete Special Inspector.
ICC-RCSI	Reinforced Concrete Special Inspector.
ICC-SBSI	Structural Steel and Bolting Special Inspector.

Abbreviation used in this Section	Description
ICC-WSI	Structural Welding Special Inspector.
National Concrete Masonry Association	
NCMA	Concrete Masonry Testing Technician.
National Institute for Certification in Engineering Technologies (NICET)	
NICET-CT	Concrete Technician – Levels II, III & IV.
NICET-ST	Soils Technician - Levels II, III & IV.
NICET-GET	Geotechnical Engineering Technician - Levels II, III & IV.
Exterior Design Institute (EDI) Certification	
EDI-EIFS	EIFS Third Party Inspector.

Inspection or Testing Item	Qualification Standards
Fabricators	Varies by product as listed below.
Steel Construction – Welding Inspection	ICC-SWSI, ICC-WSI, AWS-CWI or AWS/AISC-SSI.
Steel Construction – Non-Destructive Weld Testing	ASNT.
Steel Construction – Details	PE/SE, ICC-SWSI, ICC-SBSI or AWS/AISC-SSI.
Steel Construction – High Strength Bolts	PE/SE or ICC-SBSI.
Concrete Construction - Field Tests	ACI-CFTT or NICET-CT.
Concrete Construction - Field Inspection	PE/SE, ICC-RCSI, ACI-CCI or NICET-CT.
Concrete Construction - Laboratory Testing	ACI-LTT, ACI-STT or NICET-CT.
Prestressed Concrete Construction	ICC-PCSI.
Masonry Construction - Field Inspection	PE/SE or ICC-SMSI.

Inspection or Testing Item	Qualification Standards
Masonry Construction - Laboratory Testing	NCMA.
Soils (special grading, excavation and filling)	PE/GE, NICET-ST or NICET-GET under the direct supervision of Registered Civil (geotechnical) Engineer.
Pile Foundations	PE/GE, Appropriate structural material inspection and NICET-ST or NICET-GET under the direct supervision of Registered Civil (geotechnical) Engineer.
Pier Foundations	PE/GE, Appropriate structural material inspection and NICET-ST or NICET-GET under the direct supervision of Registered Civil (geotechnical) Engineer.
Wall Panels and Veneers	ICC-SMSI.
Sprayed Fire-Resistant Materials	ICC-SFSI.
Exterior Insulation and Finish Systems (EIFS)	ICC Building Inspector or EDI-EIFS.
Post Installed Anchors in Concrete	ICC Building Inspector, ICC-RCSI, or PE/SE.
Post Installed Anchors in Masonry	ICC Building Inspector, ICC-SMSI, or PE/SE.
Smoke Control Systems	IBC 1705.18.2.
Other Architectural Systems	ICC Building Inspector, AIA, or PE/SE.
Mechanical Systems	ICC Building Inspector or PE/ME.
Electrical Systems	See NFPA 70.

D. Structural Steel Testing Agency Requirements. Submit the following to the RDPRC and the AHJ prior to beginning testing:

1. Written practices for monitoring and control of the inspection and testing agency operations including:

    a. Inspection and testing agency's procedures for the selection and administration of inspection personnel, describing the training, experience, and examination requirements for qualification and certification of inspection personnel.
    b. Inspection and testing agency's inspection procedures, including general inspection, material controls, and visual welding inspection.

2. Qualifications of management and quality assurance personnel designated for the project.

3. Qualification records for inspectors and NDT technicians designated for the project.

4. NDT procedures and equipment calibration records for NDT to be performed and equipment to be used for the project.

1.5 CONFLICTING REQUIREMENTS, REPORTS AND TEST RESULTS

A. General

1. If compliance with two or more standards is specified and the standards establish different requirements for minimum quantities or quality levels, comply with the more stringent requirement. Refer uncertainties to the RDPRC for a decision before proceeding.

B. Minimum Quantity or Quality Levels.

1. The quantity or quality level indicated in the Construction Documents shall be the minimum provided or performed. The actual installation shall comply exactly with the minimum quantity or quality specified, or exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to the RDPRC for a decision before proceeding.

C. Precedence.

1. The Approved Agency reports and testing results shall have precedence over reports and test results provided by Contractor.

D. Conflict.

1. Where a conflict exists between the construction documents and approved shop drawings/submittal data, the construction documents shall govern unless the shop drawings/submittal data are more restrictive. All conflicts shall be brought to the attention of the RDPRC.

1.6 TECHNICAL ATTACHMENTS

A. The following forms are required as part of the comprehensive administrative, testing and inspection requirements. The AHJ may have similar documents that can be used in lieu of these forms at the time of building permit application.

Form Title	Notes
Statement of Special Inspections (SSI)	To be completed jointly by the RDPRC and the Approved Agency, and sealed by the RDPRC after completion.

	Contractor or Owner shall submit the form to the AHJ as part of the building permit application process.
Request for Approval of Individual Inspector or Technician	To be completed by Approved Agency. Approved Agency will submit the form to the AHJ and RDPRC for their approval of individual inspectors and testing technicians.
Contractor's Statement of Responsibility	To completed by Contractor and his relevant suppliers and submitted to Owner and AHJ.
Fabricator's Certificate of Compliance	To be completed by Contractor's Approved Fabricators who perform work without special inspections, and submitted to AHJ and RDPRC prior to placement of the fabricated items in the work.
Final Report of Special Inspections	To be completed and sealed by Approved Agency. Approved Agency or Owner will submit to AHJ at the completion of construction.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 CONTRACTOR AND FABRICATOR RESPONSIBILITIES.

A. Each Fabricator or Contractor responsible for the construction of a seismic-force-resisting system, designated seismic system, seismic resisting component, main wind force-resisting system, or a wind-resisting component listed in the SSI shall submit a "Contractor's Statement of Responsibility" to the AHJ and to Owner prior to the commencement of work.

B. To be considered an Approved Fabricator that may perform work without Special Inspection, the Fabricator shall submit copies of certifications from the International Accreditation Service (IAS) or other recognized and acceptable accreditation organization a minimum of 30 days prior to the start of fabrication. Acceptance as an Approved Fabricator is subject to approval by the AHJ. If the project specifications required an Approved Fabricator, and the AHJ does not accept the Fabricator as an Approved Fabricator, special inspection may become necessary in the Fabricator's shop. Such inspections will be performed by Approved Agency and Contractor shall reimburse Owner for the cost for the inspections.

C. Contractor shall provide, from each Approved Fabricator, a "Fabricator's Certificate of Compliance" indicating that the work was performed in accordance with the approved Construction Documents. The certificate(s) shall be submitted to the AHJ and the RDPRC prior to placement of the fabricated items into the work.

D. Contractor shall assist in coordination of the inspection and testing services with the progress of the work. Contractor shall provide sufficient notice to allow proper scheduling of all inspection

and testing personnel. Contractor shall provide safe access to inspection and testing personnel and shall ensure that all work requiring special inspection is not concealed prior to the completion of the inspection and/or testing.

E. Contractor shall submit schedules to Owner, RDPRC and testing and inspecting agencies. Schedules will note milestones and durations of time for materials requiring tests and special inspections.

F. Contractor shall provide the Special Inspector access to approved plans at the job site or fabrication shop as applicable.

G. Contractor shall retain at the job site or fabrication shop, as applicable, all special inspection records submitted by an Approved Agency or Special Inspector and shall provide these records for review by the AHJ's inspector upon request.

H. Contractor shall repair and/or replace work that does not meet the requirements of the construction documents.

I. Contractor shall engage an engineer to prepare repair and/or replacement procedures for any deficiencies identified. Contractor's engineer shall be registered in the state in which the project is located. Contractor's engineer shall be acceptable to the RDPRC, AHJ, and Owner. Procedures shall be submitted for review and acceptance by the RDPRC, AHJ, and Owner before proceeding with corrective action.

J. Contractor shall be responsible for costs of:

1. Re-testing and re-inspection of materials, work, and/or products that do not meet the requirements of the Contract Documents or shop drawing/submittal data.

2. Review of proposed repair and/or replacement procedures by the RDPRC and the inspectors and testing agencies.

3. Repair or replacement of work that does not meet the requirements of the Construction Documents.

3.2 APPROVED AGENCY AND SPECIAL INSPECTOR RESPONSIBILITIES.

A. Preliminary Approval of Special Inspectors and Testing Technicians

1. The Approved Agency will submit a "Request for Approval of Individual Inspector or Technician" form to the AHJ and RDPRC for each proposed Special Inspector or testing technician. The form will include the individual's credentials, which as a minimum will meet the requirements indicated in this section. Inspector and technician certifications by organizations other than those listed herein will not be acceptable without approval of the AHJ and RDPRC. The AHJ may have additional requirements to those specified herein. It is the responsibility of the testing and inspection agencies to meet local requirements and comply with local procedures.

B. Perform Inspections and Tests

1. Be present for and perform continuous or periodic inspections and tests as listed in the SSI for conformance of the work to the AHJ approved Construction Documents. Notify Contractor personnel of their presence and responsibilities. When the SSI column titled "Other Code, Standard or Reference" indicates "Manufacturer's research reports", inspector will obtain the most current ICBO-ES Report, ICC-ES Legacy Report, ICC-ES Report, or IAPMO UES Evaluation Report (as applicable) prior to the applicable inspection, for inspection requirements related to the type and brand of products or materials being inspected.

2. Provide additional inspections and testing as necessary to determine compliance with the Construction Documents. Perform special inspections in a timely manner to avoid delay of work.

3. The Approved Agency shall be responsible to insure that all inspection or testing activity, whether performed locally or at off-site fabrication facilities, fully complies with this section and the SSI.

C. Defective Work

1. Immediately notify Contractor of the need for corrective action when work does not conform to Construction Documents.

D. Uncorrected Defective Work

1. Notify the AHJ and RDPRC when deficiencies have not been corrected. Notice will be made prior to the completion of that phase of the work.

E. Interim Inspection Reports

1. Furnish interim inspection reports to the AHJ, the RDPRC, Contractor, Engineer, and Owner during the progress of the work. Frequency of reports will be as established in the SSI. Reports will indicate that work inspected was done in conformance to the approved Construction Documents, or that the work was defective, as applicable.

2. Special inspection reports and test results will include, but not be limited to, the following:

   a. Project name and address.
   b. Permit number.
   c. Special Inspection Agency name, address, and phone number.
   d. Unique identification of the report and of each page.
   e. Date and time of inspection.
   f. Description of inspections or tests performed, including item description and location (reference grid lines, floors, elevations, etc.). Identify approved agencies employed to carry out tests.
   g. Identification of test/inspection equipment used.
   h. Statement noting that the work, material, and/or product conforms or does not conform to the construction document requirements. Describe defective items.
   i. Name and signature of Contractor's representative who was notified of work, material, and/or products that do not meet the construction document requirements.

j. Name and signature of Special Inspector and/or testing agency representative performing the work.

F. Report of Defective Work

1. Each agent will maintain a log that identifies work that does not meet the requirements of the construction documents. Include:

a. Description and exact location.
b. Reference to applicable drawings and specifications.
c. Reference to original inspection/test report and subsequent dates of re-inspection/retesting.
d. Name and title of each individual notified and method of notification.
e. How defective items were resolved or unresolved, as applicable.
f. Itemized changes authorized by the RDPRC and AHJ if not included in a defective item.

G. Submittal Schedule.

1. Documentation of reports, test results, and non-compliant work will be submitted at the frequency indicated in the SSI.

H. Final Report of Special Inspections.

1. Each agent listed in the SSI shall submit a final report to the Approved Agency documenting the performed special inspections and the correction of any discrepancies noted. The Approved Agency shall cumulate the reports and submit a comprehensive final report at a point in time as agreed upon by the permit applicant and the AHJ prior to the start of work.

End of Section

Statement of Special Inspections

Project:
Project Address:
Permit Applicant:
Applicant Address:
Owner:
Owner Address:

Registered Design Professional in Responsible Charge (RDPRC) :

Discipline	Name	License Number	Expiration Date
Structural Engineer			
Geotechnical Engineer			
Mechanical Engineer			
Electrical Engineer			
Architect			

This Statement of Special Inspections includes a *Schedule of Special Inspections* applicable to the above referenced project as well as the identity of the individuals, agencies, or firms intended to be retained for conducting these inspections.

The Special Inspector(s) shall keep records of all inspections and shall furnish interim inspection reports to the Authority Having Jurisdiction (AHJ) and to the Registered Design Professional in Responsible Charge (RDPRC). Discrepancies shall be brought to the immediate attention of the Contractor for correction. If the discrepancies are not corrected, the discrepancies shall be brought to the attention of the AHJ and the RDPRC prior to completion of that phase of work. A *Final Report of Special Inspections* documenting required special inspections and correction of any discrepancies noted in the inspections shall be submitted by each agent.

The Special Inspection program does not relieve the Contractor of the responsibility to comply with the Contract Documents. Jobsite safety and means and methods of construction are solely the responsibility of the Contractor.

Inspection work shall be performed in accordance with the following codes and standards. Unless otherwise indicated within the Statement of Special Inspections, the applicable edition for all codes and standards shall be as follows.

Work	In Accordance With
Building Code	2018 International Building Code (IBC)
Seismic Criteria for Nonstructural Components	ASCE 7-16
Standard Tests and Practices	American Society for Testing and Materials (ASTM) International specifications
Concrete	ACI 318-14 and ACI 350-06
Masonry	TMS 402-16 and TMS 602-16
Structural Steel	AISC 360-16 and AISC 341-16
Structural steel welding	AWS D1.1 Structural Welding Code - Steel
Aluminum welding	AWS D1.2 Structural Welding Code – Aluminum

Work	**In Accordance With**
Sheet steel welding	AWS D1.3 Structural Welding Code – Sheet Steel
Structural steel bolting	Research Council on Structural Connections Specification for Structural Joints Using High Strength Bolts, August 1, 2014
Intumescent Fire-Resistive Coating	Association of the Wall and Ceiling Industry (AWCI) Technical Manual 12-B, Second Edition; Standard Practice for the Testing and Inspection of Field Applied Thin Film Intumescent Fire-Resistive Materials; an Annotated Guide

RDPRC - Structural	RDPRC - Civil/Geotechnical	RDPRC - Mechanical
RDPRC – Electrical	RDPRC - Architect	

Owner's Acknowledgement:

Signature Date

Acceptance by Authority Having Jurisdiction:

Signature Date

Permit No.

Frequency of interim report submittals to AHJ:

□ 1 week □ 2 weeks □ Monthly □ Bi-Monthly □ At Completion □ Per attached Schedule

Statement of Special Inspections
(Schedule of Inspections)

The attached tables as listed below define the applicable Special Inspections and Procedures.

Table 1 of 9	Geotechnical Special Inspections
Table 2 of 9	Structural Special Inspections
Table 3 of 9	Architectural Special Inspections – NOT USED
Table 4 of 9	Inspections for Special Cases – NOT USED
Table 5 of 9	Testing for Special Inspections
Table 6 of 9	Special Inspections for Seismic Resistance
Table 7 of 9	Testing for Seismic Resistance – NOT USED
Table 8 of 9	Special Inspections for Wind Resistance – NOT USED
Table 9 of 9	Individual Inspection and Testing Agents

The Seismic Design Category for the project is D.

The allowable stress design wind speed, V_{asd}, for the project is 117 mph (3 second gust) and the wind exposure category is C.

Schedule of Special Inspections - Table 1 of 9 (Geotechnical Special Inspections)						
	Inspection					
	Building Code Reference	Other Code, Standard or Reference	Frequency		Remarks	Inspection Agent No. (see Table 9)
System or Material			Continuous	Periodic		
Soils						
Verify material below foundation is adequate to achieve design bearing capacity, free of loose, deleterious or foreign material.	1705.6	Geotechnical Report		**X** (foundation excavation complete)	**Vaults**	
Verify excavations are extended to proper depth, proper size and material.	1705.6	Geotechnical Report		**X** (foundation excavation complete)	**Vaults**	
Prior to placement of controlled fill, inspect subgrade and verify site is properly prepared.	1705.6	Geotechnical Report		**X** (prior to placement of fill)	**Vaults**	
Perform classification and testing of compacted fill material.	1705.6	Geotechnical Report		**X** (during placement of fill)		
Verify materials, densities, and lift thicknesses during placement and compaction of controlled fill for foundations.	1705.6	Geotechnical Report	**X**		Note the exception of Article 1705.6.	

Schedule of Special Inspections - Table 2 of 9 (Structural Special Inspections)						
	Inspection					
	Building Code Reference	Other Code, Standard or Reference	Frequency		Remarks	Inspection Agent No. (see Table 9)
System or Material			Continuous	Periodic		
Post-Installed Anchors – Expansion and Undercut Anchors into Concrete						
Verify anchor type, size, dimensions, location, spacing, edge distance, drill bit type, drill bit diameter, embedment depth, tightening torque, hole dimensions, hole cleaning procedure, concrete compressive strength, concrete thickness, and adherence to the manufacturer's installation instructions.	1705.3 1703.4.2 1705.1.1	Manufacturer's research report		**X**	Continuous inspection is required if mandated by manufacturer's research report.	
Post-Installed Anchors – Adhesive Anchors into Concrete						
Adhesive anchors installed in overhead, upwardly inclined, or horizontal positions: Verify anchor type, size, dimensions, location, spacing, edge distance, embedment depth, tightening torque, hole dimensions, hole cleaning procedure, concrete compressive strength, concrete thickness, adhesive identification, adhesive expiration date, and adherence to the manufacturer's installation instructions.	1705.3 1703.4.2 1705.1.1	Manufacturer's research report	**X**			

Schedule of Special Inspections - Table 2 of 9 (Structural Special Inspections)						
	Inspection					
	Building Code Reference	Other Code, Standard or Reference	Frequency		Remarks	Inspection Agent No. (see Table 9)
System or Material			Continuous	Periodic		
Adhesive anchors installed in other positions: Verify anchor type, size, dimensions, location, spacing, edge distance, embedment depth, tightening torque, hole dimensions, hole cleaning procedure, concrete compressive strength, concrete thickness, adhesive identification, adhesive expiration date, and adherence to the manufacturer's installation instructions.	1705.3 1703.4.2 1705.1.1	Manufacturer's research report		**X**	Inspection required at start of job for each type and size of adhesive anchor by construction personnel on site. Subsequent installations of the same anchor type and size by the same personnel shall be inspected periodically, unless continuous inspections are mandated by the manufacturer's research report. Any change in the anchor product being installed or the personnel performing the installation shall require another initial inspection.	

Schedule of Special Inspections - Table 3 of 9 (Architectural Special Inspections) – NOT USED						
	Inspection					
	Building Code Reference	Other Code, Standard or Reference	Frequency		Remarks	Inspection Agent No. (see Table 9)
System or Material			Continuous	Periodic		

Schedule of Special Inspections - Table 4 of 9 (Inspections for Special Cases) – NOT USED						
	Inspection					
	Building Code Reference	Other Code, Standard or Reference	Frequency		Remarks	Inspection Agent No. (see Table 9)
System or Material			Continuous	Periodic		

Schedule of Special Inspections - Table 5 of 9 (Testing for Special Inspections)					
	Testing				
System or Material	Building Code Reference	Other Code, Standard or Reference	Frequency	Remarks	Testing Agent No. (see Table 9)
Geotechnical					
Classification of controlled fill material.	1705.6	ASTM D2488	One per stratum of on-site excavated material. One per common supply of off-site material.	Per Geotechnical Report and excavation and fill for structures specification.	
Foundation subgrade, in-place density.	1705.6	ASTM D2922 ASTM D1556 or ASTM D2167 (10% of tests to be ASTM D1556 or ASTM D2167)	One test per 1,000 SY, or as required in the excavation and fill for structures specification. Min one per foundation for foundations over 10 SY.	Per Geotechnical Report and excavation and fill for structures specification.	
Controlled fill beneath foundations, in-place density.	1705.6	ASTM D2922 ASTM D1556 or ASTM D2167 (10% of tests to be ASTM D1556 or ASTM D2167)	One test per 200 CY, or as required in the excavation and fill for structures specification. Min one per foundation for foundations over 10 SY.	Per Geotechnical Report and excavation and fill for structures specification.	
Concrete					

Schedule of Special Inspections - Table 5 of 9 (Testing for Special Inspections)					
	Testing				
System or Material	**Building Code Reference**	**Other Code, Standard or Reference**	**Frequency**	**Remarks**	**Testing Agent No**. (see Table 9)
Concrete strength.	1705.3	ASTM C31 ASTM C39 ASTM C172	See concrete specification	See concrete specification for quantity of cylinders.	
Concrete slump, air content, temperature, unit weight, water soluble chloride ion, shrinkage.	1705.3	ASTM C31 ASTM C138 ASTM C143 ASTM C157 ASTM C172 ASTM C231 ASTM C1064 ASTM C1218	See concrete specification		

Schedule of Special Inspections - Table 6 of 9 (Special Inspections for Seismic Resistance)						
	Inspection					
			Frequency			
System or Material	**Building Code Reference**	**Other Code, Standard or Reference**	**Continuous**	**Periodic**	**Remarks**	**Inspection Agent No**. (see Table 9)
Nonstructural Components						
For non-structural components that are qualified by means of shake table testing or experience data, verify that the label, anchorage, and mounting conform to the certificate of compliance furnished by the product manufacturer.	1705.12.4	ASCE 7 (13.2.2)		**X** (Each applicable piece of equipment)	See the Meteorological and Seismic Design Criteria section (Non-Structural Components Schedule) for the specific components and their anchorages that must be qualified.	

Schedule of Special Inspections - Table 7 of 9 (Testing for Seismic Resistance) – NOT USED					
	Testing				
System or Material	**Building Code Reference**	**Other Code, Standard or Reference**	**Frequency**	**Remarks**	**Testing Agent No**. (see Table 9)

Schedule of Special Inspections - Table 8 of 9 (Special Inspections for Wind Resistance) – Not Used						
	Inspection					
			Frequency			
System or Material	**Building Code Reference**	**Other Code, Standard or Reference**	**Continuous**	**Periodic**	**Remarks**	**Inspection Agent No.** (See Table 9)

Schedule of Special Inspections - Table 9 of 9 (Individual Inspection and Testing Agents)					
NAME	**LICENSE NO.**	**FIRM**	**ADDRESS**	**EMAIL**	**TELEPHONE NO.**
1.					( )
2.					( )
3.					( )
4.					( )
5.					( )
6.					( )
7.					( )
8.					( )
9.					( )
10.					( )

Request for Approval of Individual Inspector or Testing Technician

Project:
Project Address:
Name of Inspection/Testing Agency:
Address:
Phone Number:
Name of Primary Inspection Agency's manager/supervisor:

Special Inspector or Testing Technician Name:

Special Inspector or Testing Technician Signature: _____
(as it will appear on reports)

This individual is qualified to inspect:

[ ] Verification of Soils
[ ] Earth Retaining Structure
[ ] Excavation and Filling
[ ] Piling
[ ] Drilled Piers
[ ] Testing of Concrete
[ ] Placement of Concrete
[ ] Placement of Shotcrete
[ ] Placement of Rebar
[ ] Prestressing Concrete
[ ] High Strength Bolting
[ ] Structural Welding
[ ] Steel Frame Inspection
[ ] Structural Masonry
[ ] Erection of Precast
[ ] Inspection of Fabricators
[ ] Precast Fabrication
[ ] Structural Steel
[ ] Metal Building
[ ] EIFS Inspection
[ ] Smoke Control
[ ] Seismic Resistance
[ ] Sprayed Fireproofing
[ ] Architectural Systems
[ ] Mechanical Systems
[ ] Electrical Systems

Current certifications and/or professional licenses retained by the individual:

[ ] Professional Engineer
[ ] Geotechnical Engineer
[ ] Structural Engineer
[ ] Registered Architect
[ ] Registered Geologist
[ ] EI/EIT (min. of 1 yr. related experience)
[ ] GIT (min. of 1 yr. related experience)
[ ] ACI Concrete Field Testing Technician Grade 1
[ ] ACI Concrete Construction Inspector
[ ] ACI Laboratory Testing Technician, Grade 1 or 2
[ ] ACI Strength Testing Technician
[ ] AWS Certified Welding Inspector
[ ] AWS/AISC Certified Structural Steel Inspector
[ ] ASNT NDT Technician Level II or III
[ ] ICC Building Inspector
[ ] ICC Structural Masonry
[ ] ICC Structural Steel and Welding
[ ] ICC Spray-Applied Fire Proofing
[ ] ICC Prestressed Concrete
[ ] ICC Reinforced Concrete
[ ] ICC Structural Steel and Bolting
[ ] ICC Structural Welding
[ ] NCMA Concrete Masonry Testing Technician
[ ] NICET Concrete Technician Level II, III, or IV
[ ] NICET Soils Technician Level II, III, or IV
[ ] NICET Geotechnical Engineering Technician Level II, III, or IV
[ ] EDI EIFS
[ ] Other _____

Copies of current certifications and/or professional licenses and a resume showing the individual's work experience are attached.

I hereby certify that in my judgment the individual is qualified to inspect and/or test the items indicated above.

Primary Special Inspection Agency:

Signed:_____Date:_____
(Primary inspection agency's manager/supervisor)

Contractor's Statement of Responsibility

Each Fabricator, Contractor, or Supplier responsible for the construction or fabrication of a system or component designated in the Statement of Special Inspections shall submit this Statement of Responsibility.

Project:
Contractor's or Supplier's Name:
Address:
License No.:

Description of designated building systems and components included in the Statement of Responsibility:

Acknowledgment of Special Requirements

I hereby acknowledge that I have received, read, and understand the Code Required Special Inspections and Tests program and the Schedule of Special Inspections.

I hereby acknowledge that control will be exercised to obtain conformance with the construction documents approved by the Authority Having Jurisdiction.

Signature Date

Title

Provisions for Quality Control

Procedures for exercising control within the Fabricator's, Contractor's, or Supplier's organization, the method and frequency of reporting and the distribution of reports are attached to this Statement.

Identification and qualifications of the person(s) exercising such control and their position(s) in the organization are attached to this Statement.

Fabricator's Certificate of Compliance

Each approved fabricator that is exempt from Special Inspection of their shop fabricated items shall submit this *Fabricator's Certificate of Compliance* at the completion of fabrication.

Project:
Fabricator's Name:
Address:
Certification or Approval Agency:
Certification Number:
Date of Last Audit or Approval:

Description of structural members and assemblies that have been fabricated:

I hereby certify that items described above were fabricated in strict accordance with the approved construction documents.

Signature Date

Title

Attach copies of fabricator's certification or building code evaluation service report and fabricator's quality control manual.

Final Report of Special Inspections

Project:
Project Address:

Testing / Inspection Agent:
Testing / Inspection Agent Address:
Scope of Testing / Inspections:

To the best of my information, knowledge, and belief, the special inspections or testing required for this project, and designated for this Agent in the Statement of Special Inspections submitted for permit, have been completed in accordance with the contract documents. Based upon my personal observations and written reports, it is my judgment that the inspected work was performed, to the best of my knowledge, in accordance with the building department approved design drawings, specifications, approved change orders, and applicable workmanship provisions of the governing building code.

Interim reports submitted prior to this final report and numbered _____ to _____, form a basis for, and are to be considered an integral part of this final report.

The following discrepancies that were outstanding since the last interim report dated have been corrected:

Items not in conformance, unresolved items or any discrepancies in inspection coverage (i.e., missed inspections, periodic inspections when continuous was required, etc.) are as follows:

Special Inspector's Seal

Prepared By:

Type or print name

Signature Date

(Licensed Professional)

SECTION 01500 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 UNITS OF MEASUREMENT.

A. When both inch-pound (English) and SI (metric) units of measurement are specified herein, the values expressed in inch-pound units shall govern.

1.2 OFFICE AT SITE OF WORK.

A. During the performance of this Contract, Contractor shall maintain a suitable office at or near the Site which shall be the headquarters of its representative authorized to receive drawings, instructions, or other communication or articles.

B. Any communication given to the said representative or delivered at Contractor's office at the Site in the representative's absence shall be deemed to have been delivered to Contractor.

C. Copies of the Drawings, Specifications, and other Contract Documents shall be kept at Contractor's office at the Site and available for use at all times.

1.3 WATER.

A. All water required for and in connection with the Work to be performed will be furnished by Owner in the vicinity of the Site without charge to Contractor, provided:

1. The Contractor will be allowed to use water from Kansas City’s distribution system via four 2” hose bibs with the Intake Pump Station at no cost for cleaning, testing, and other construction purposes. Contractor shall install portable backflow preventer at each water connection where water is obtained for construction purposes in accordance with the regulations of the Water Services Department. If the Contractor obtains the backflow preventer from the Water Services Department, Contractor shall pay the required deposits and costs associated with the use of the backflow preventer during the project.

2. Contractor shall procure such water in the location and in the manner designated by Owner.

3. Contractor at its own expense shall make authorized connections and provide means for delivering the water to the Site.

4. Approval of the Owner shall be obtained before water is used. Waste of water by the Contractor shall be sufficient cause for withdrawing the privilege of

unrestricted use. Connection to hydrants shall be completed under the supervision of the Owner's personnel.

5. At the end of the project, Contractor shall remove all connections to the satisfaction of the Owner.

1.4 POWER.

A. Contractor shall provide all power for heating, lighting, operation of Contractor's plant or equipment, or for any other use by Contractor. Temporary heat and lighting shall be maintained until the Work is accepted.

1.5 WIRELESS VOICE AND DATA SERVICES.

A. Contractor shall make all necessary arrangements and pay for their own cellular phones and wireless hotspot capability for wireless voice and data services in its offices at the Site. Resident Project Representative shall have access to the hotspot within the field office.

1.6 SANITARY FACILITIES.

A. Contractor shall furnish temporary sanitary facilities at the Site, as provided herein, for the needs of all construction workers and others performing work or furnishing services on the Project.

B. Sanitary facilities shall be of reasonable capacity, properly maintained throughout the construction period, and obscured from public view to the greatest practical extent. If toilets of the chemically treated type are used, at least one toilet will be furnished for each 20 persons. Contractor shall enforce the use of such sanitary facilities by all personnel at the Site.

1.7 CONSTRUCTION AIDS.

A. Contractor shall furnish, install, maintain, and operate all construction aids required by it and its Subcontractors in the performance of the Work, except as otherwise provided herein.

B. The use of any plant equipment, whether furnished and installed under this Contract or not, including elevators, shop cranes, heating, ventilating, air conditioning, and plumbing fixtures, shall be only with Owner's written permission.

1.8 MAINTENANCE OF TRAFFIC.

A. All roads, drives, parking, and parking areas shall be kept free of mud, dirt, and other debris caused by Contractor's operations.

B. Contractor shall conduct its work to interfere as little as possible with public travel, whether vehicular or pedestrian. Whenever it is necessary to cross, obstruct, or close roads, driveways, and walks, whether public or private, Contractor shall provide and maintain suitable and safe bridges, detours, or other temporary expedients for the accommodation of public and private travel, and shall give reasonable notice to owners of private drives before interfering with them. Such maintenance of traffic will not be required when Contractor has obtained permission from the owner and tenant of private property, or from the authority having jurisdiction over public property involved, to obstruct traffic at the designated point.

C. In making open-cut street crossings, Contractor shall not block more than one-half of the street at a time. Whenever possible, Contractor shall widen the shoulder on the opposite side to facilitate traffic flow. Temporary surfacing shall be provided as necessary on shoulders.

1.9 BARRICADES AND LIGHTS.

A. All streets, roads, and other public thoroughfares which are closed to traffic shall be protected by effective barricades on which shall be placed acceptable warning signs. Barricades shall be located at the nearest intersecting public highway or street on each side of the blocked section.

B. All open trenches and other excavations shall have suitable barricades, signs, and lights to provide adequate protection to the public. Obstructions, such as material piles and equipment, shall be provided with similar warning signs and lights.

C. All barricades and obstructions shall be illuminated with warning lights from sunset to sunrise. Material storage and conduct of the Work on or alongside public streets and highways shall cause the minimum obstruction and inconvenience to the traveling public.

D. All barricades, signs, lights, and other protective devices shall be installed and maintained in conformity with applicable statutory requirements and, where within railroad and highway rights-of-way, as required by the authority having jurisdiction.

1.10 FENCES.

A. All existing fences affected by the Work shall be maintained by Contractor until completion of the Work. Fences which interfere with construction operations shall not be relocated or dismantled until written permission is obtained from the owner of the fence, and the period the fence may be left relocated or dismantled has been agreed upon. Where fences must be maintained across the construction easement, adequate

gates shall be installed. Gates shall be kept closed and locked at all times when not in use.

B. On completion of the Work across any tract of land, Contractor shall restore all fences to their original or to a better condition and to their original locations.

1.11 PROTECTION OF PUBLIC AND PRIVATE PROPERTY.

A. Contractor shall protect, shore, brace, support, and maintain all underground pipes, conduits, drains, and other underground construction uncovered or otherwise affected by its construction operations. All pavement, surfacing, driveways, curbs, walks, buildings, utility poles, guy wires, fences, and other surface structures affected by construction operations, together with all sod and shrubs in yards, parkways, and medians, shall be restored to their original condition, whether within or outside the easement. All replacements shall be made with new materials.

B. No trees shall be removed outside the permanent easement, except where authorized by Engineer. Whenever practicable, Contractor shall tunnel beneath trees in yards and parking areas when on or near the line of trench. Hand excavation shall be employed as necessary to prevent injury to trees. Trees left standing shall be adequately protected against damage from construction operations.

C. Contractor shall be responsible for all damage to streets, roads, highways, shoulders, ditches, embankments, culverts, bridges, and other public or private property, regardless of location or character, which may be caused by transporting equipment, materials, or workers to or from the Work or any part or site thereof, whether by Contractor of its Subcontractors. Contractor shall make satisfactory and acceptable arrangements with the owner of, or the agency or authority having jurisdiction over, the damaged property concerning its repair or replacement or payment of costs incurred in connection with the damage.

D. All fire hydrants and water control valves shall be kept free from obstruction and available for use at all times.

1.12 DAMAGE TO EXISTING PROPERTY.

A. Contractor will be held responsible for any damage to existing structures, Work, materials, or equipment because of his operations and shall repair or replace any damaged structures, Work, materials, or equipment to the satisfaction of, and at no additional cost to, Owner.

B. Contractor shall protect all existing structures and property from damage and shall provide bracing, shoring, or other work necessary for such protection.

C. Contractor shall be responsible for all damage to streets, roads, curbs, sidewalks, highways, shoulders, ditches, embankments, culverts, bridges, or other public or private property, which may be caused by transporting equipment, materials, or workers to or from the Work. Contractor shall make satisfactory and acceptable arrangements with

the agency having jurisdiction over the damaged property concerning its repair or replacement.

1.13 TREE AND PLANT PROTECTION.

A. All trees and other vegetation which must be removed to perform the Work shall be removed and disposed of by Contractor; however, no trees or cultured plants shall be unnecessarily removed unless their removal is indicated on the Drawings. All trees and plants not removed shall be protected against injury from construction operations.

B. Trees considered by Engineer to have any significant effect on construction operations are indicated on the Drawings and those which are to be preserved are so indicated.

C. Contractor shall take extra measures to protect trees designated to be preserved, such as erecting barricades, trimming to prevent damage from construction equipment, and installing pipe and other Work by means of hand excavation or tunneling methods. Such trees shall not be endangered by stockpiling excavated material or storing equipment against their trunks.

D. When injuring or removal of trees designated to be preserved cannot be avoided, or when removal and replacement is indicated on the Drawings, each tree injured beyond repair or removed shall be replaced with a similar tree of the nearest size possible.

E. All trimming, repair, and replacement of trees and plants shall be performed by qualified nurserymen or horticulturists.

1.14 FLOOD PROTECTION

A. The facilities to be constructed are located in a flood hazard. During the construction period, Contractor shall monitor river elevations and take necessary steps to move equipment and materials if river elevations warrant. Contractor shall communicate with Owner any concerns about rising river elevations and potential schedule impacts.

B. Contractor shall have bedding and backfill material stockpiled on site and shall be prepared to fill in any trenches or excavations based on river level as indicated in the Project Requirements sections (Unfavorable Construction Conditions and North Kansas City Levee District paragraph).

C. Additional requirements for flood protection and North Kansas City Levee District requirements are specified in the Project Requirements and Excavation and Trenching sections.

1.15 SECURITY.

A. Contractor shall be responsible for protection of the Site, and all Work, materials, equipment, and existing facilities thereon, against vandals and other unauthorized persons.

B. No Claim shall be made against Owner by reason of any act of an employee or trespasser, and Contractor shall make good all damage to Owner's property resulting from Contractor's failure to provide security measures as specified.

C. Security measures shall be at least equal to those usually provided by Owner to protect Owner's existing facilities during normal operation, but shall also include such additional security fencing, barricades, lighting, watchman services, and other measures as required to protect the Site.

1.16 SITE MAINTENANCE

A. Adequate cleanup shall be a condition for the processing of the Contractor’s monthly progress payment method.

B. The Contractor shall, at all times, keep the premises from accumulations of excavated materials, waste materials and other debris resulting from the Work. Site maintenance shall include, but is not limited to, the following:

1. The Contractor shall sweep streets daily to maintain the Site in a neat and clean condition.

2. Provide adequate trash receptacles on the Site and promptly empty when filled.

3. Conduct periodic cleanup of the Site to avoid hazards, interference with traffic or operations at the Site.

4. Keep construction materials such as pipe, forms and scaffolding neatly stacked.

5. Conduct immediate cleanup to protect the Work by removing splattered concrete, asphalt, oil, paint, corrosive liquids and cleaning solutions from all surfaces (linear construction) including walls, floors and metal surfaces (vertical construction) before the surfaces are marred.

6. Volatile wastes shall be properly stored in covered metal containers and removed from the Site daily.

7. Wastes shall not be buried on the site or disposed of into storm drains, sanitary sewers, streams or waterways. All wastes shall be removed from the site and disposed of in a manner complying with all local permits, ordinances and anti-pollution laws.

8. Overloading of trucks is prohibited to prevent spillages on all access and haul routes. The Contractor shall provide periodic inspection of traffic areas to enforce the requirements of this Section.

9. The Contractor shall prevent all excess material from washing into stream beds, storm water facilities, streets, culverts, etc.

C. All excavated material not incorporated into the Work shall be removed and disposed of by the Contractor so that the site will be left in equal or better condition than its original state.

D. Any deficiency in the quantity of material for filling depressions caused by settlement shall be supplied by the Contractor.

E. The Contractor shall remove all mobilized equipment, surplus materials, debris and temporary facilities from the site. The construction site shall be left in its original condition or better condition than before the Work commenced.

1.17 SITE ACCESS

A. Gate card access should be FOBs or will be unlocked during working hours. The number to be issued and other details will be discussed at the pre-bid conference. Site may be unlocked by Owner on certain days.

1.18 PARKING.

A. Contractor shall provide and maintain suitable parking areas for the use of all workers and others performing work or furnishing services in connection with the Project, as required to avoid any need for parking personal vehicles where they may interfere with public traffic, Owner's operations, or construction activities.

1.19 NOISE CONTROL.

A. Contractor shall take reasonable measures to avoid unnecessary noise. Such measures shall be appropriate for the normal ambient sound levels in the area during working hours. All construction machinery and vehicles shall be equipped with practical sound-muffling devices, and operated in a manner to cause the least noise consistent with efficient performance of the Work.

B. During construction activities on or adjacent to occupied buildings, and when appropriate, Contractor shall erect screens or barriers effective in reducing noise in the building and shall conduct its operations to avoid unnecessary noise which might interfere with the activities of building occupants.

1.20 DUST CONTROL.

A. Contractor shall take reasonable measures to prevent unnecessary dust. Earth surfaces subject to dusting shall be kept moist with water or by application of a chemical dust suppressant. When practicable, dusty materials in piles or in transit shall be covered to prevent blowing dust.

B. Buildings or operating facilities which may be affected adversely by dust shall be adequately protected from dust. Existing or new machinery, motors, instrument panels, or similar equipment shall be protected by suitable dust screens. Proper ventilation shall be included with dust screens.

C. Contractor shall maintain and keep all streets clean throughout the Work period. The Contractor shall perform street sweeping on a daily basis to remove dust and debris from paved areas within the Work site as well as on all access and haul routes.

1.21 TEMPORARY DRAINAGE PROVISIONS.

A. Contractor shall provide for the drainage of storm water and such water as may be applied or discharged on the Site in performance of the Work. Drainage facilities shall be adequate to prevent damage to the Work, the Site, and adjacent property.

B. Existing drainage channels and conduits shall be cleaned, enlarged, or supplemented as necessary to carry all increased runoff attributable to Contractor's operations. Dikes shall be constructed as necessary to divert increased runoff from entering adjacent property (except in natural channels), to protect Owner's facilities and the Work, and to direct water to drainage channels or conduits. Ponding shall be provided as necessary to prevent downstream flooding.

C. Additional requirements for erosion control are covered in the Erosion Control section.

1.22 TEMPORARY WEATHER PROTECTION

A. Contractor shall provide temporary weather protection for the work as required to meet the shut down time limitations as indicated in the Project Requirement Section.

1.23 EROSION CONTROL.

A. Contractor shall prevent erosion of soil on the Site and adjacent property resulting from its construction activities. Effective measures shall be initiated prior to the commencement of clearing, grading, excavation, or other operation that will disturb the natural protection.

B. Work shall be scheduled to expose areas subject to erosion for the shortest possible time, and natural vegetation shall be preserved to the greatest extent practicable. Temporary storage and construction buildings shall be located, and construction traffic

routed, to minimize erosion. Temporary fast-growing vegetation or other suitable ground cover shall be provided as necessary to control runoff.

C. Additional requirements for erosion control are covered in the erosion control section.

1.24 POLLUTION CONTROL.

A. Contractor shall prevent the pollution of drains and watercourses by sanitary wastes, sediment, debris, and other substances resulting from construction activities. No sanitary wastes shall be permitted to enter any drain or watercourse other than sanitary sewers. No sediment, debris, or other substance shall be permitted to enter sanitary sewers, and reasonable measures shall be taken to prevent such materials from entering any drain or watercourse.

1.25 CONCRETE WASHOUT FACILTIIES

A. The Contractor shall provide facilities for concrete washout to collect and retain all the concrete washout water and solids in leak proof containers.

B. Lined wash pits or washout boxes are acceptable.

C. Alternate methods for washout facilities may be considered by the City. The Contractor shall submit for review and approval, per Section 01300 – Submittals, the alternate methods and facilities to be used.

D. Concrete washout facilities shall be inspected daily and after heavy rains to check for leaks, identify any plastic linings or sidewalls that have been damaged by construction activities and determine whether they have been filled to over 75 percent capacity.

E. When the washout container is filled to over 75 percent of its capacity, the wash- water shall be vacuumed out or allowed to evaporate to avoid overflows.

F. When the remaining cementitious solids have hardened, they shall be removed from the Site.

G. Damages to the washout container shall be repaired promptly.

H. Before heavy rains, the washout container’s liquid level shall be lowered or the container shall be covered to avoid an overflow during the rain storm.

I. Washout facilities shall be removed from the Site upon completion of the Work and the area restored as specified herein.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

End of Section

SECTION 01560 - TEMPORARY BARRIERS AND ENCLOSURES

PART 1 - GENERAL

1.1 PROTECTION OF PUBLIC AND PRIVATE PROPERTY

A. Contractor shall protect, shore, brace, support, and maintain all existing equipment, piping, building, underground pipes, conduits, drains, and other underground construction uncovered or otherwise affected by his construction operations. All pavement, surfacing, driveways, curbs, walks, buildings, utility poles, guy wires, fences, and other surface structures affected by construction operations, together with all sod and shrubs in yards and plantings, shall be restored to their original conditions, whether within or outside the easement. All replacements shall be made with new materials.

B. Contractor shall be responsible for all damage to existing equipment, piping, building, streets, roads, highway, shoulders, ditches, embankments, culverts, bridges, and other public or private property, regardless of location or character, which may be caused by transporting equipment, materials, or men to or from the Work or any part or site thereof, whether by him or his Subcontractors. Contractors shall make satisfactory and acceptable arrangements with the owner of, or the agency or authority having jurisdiction over, the damaged property concerning its repair or replacement or payment of costs incurred in connection with the damage.

C. All fire hydrants and water control valves shall be kept free from obstruction and available for use at all times.

1.2 DAMAGE TO EXISTING PROPERTY

A. Contractor will be held responsible for any damage to existing structures, Work, materials, or equipment because of his operations and shall repair or replace any damaged structures, Work, materials, or equipment to the satisfaction of, and at no additional cost to, Owner.

B. Contractor shall protect all existing structures and property from damage and shall provide bracing, shoring, or other work necessary for such protection.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

End of Section

SECTION 01610 - GENERAL EQUIPMENT STIPULATIONS

PART 1 - GENERAL

1.1 SCOPE.

A. When an equipment specification section in this Contract references this section, the equipment shall conform to the general stipulations set forth in this section, except as otherwise specified in other sections.

1.2 COORDINATION.

A. Contractor shall coordinate all details of the equipment with other related parts of the Work, including verification that all structures, piping, wiring, and equipment components are compatible. Contractor shall be responsible for all structural and other alterations in the Work required to accommodate equipment differing in dimensions or other characteristics from that contemplated in the Drawings or Specifications.

1.3 MANUFACTURER'S EXPERIENCE.

A. Unless specifically named in the Specifications, a manufacturer shall have furnished equipment of the type and size specified which has been in successful operation for not less than the past 5 years.

1.4 WORKMANSHIP AND MATERIALS.

A. Contractor shall guarantee all equipment against faulty or inadequate design, improper assembly or erection, defective workmanship or materials, and leakage, breakage, or other failure. Materials shall be suitable for service conditions.

B. All equipment shall be designed, fabricated, and assembled in accordance with recognized and acceptable engineering and shop practice. Individual parts shall be manufactured to standard sizes and thicknesses so that repair parts, furnished at any time, can be installed in the field. Like parts of duplicate units shall be interchangeable. Equipment shall not have been in service at any time prior to delivery, except as required by tests.

C. Except where otherwise specified, structural and miscellaneous fabricated steel used in equipment shall conform to AISC standards. All structural members shall be designed for shock or vibratory loads. Unless otherwise specified, all steel which will be submerged, all or in part, during normal operation of the equipment shall be at least 1/4 inch thick. When dissimilar metal components are used, consideration shall be given to prevention of galvanic corrosion.

1.5 STRUCTURAL DESIGN REQUIREMENTS.

A. All equipment, including non-structural components and non-building structures as defined in ASCE 7, and their anchorage, shall be designed and detailed in accordance with the Meteorological and Seismic Design Criteria section.

1.6 LUBRICATION.

A. Equipment shall be adequately lubricated by systems which require attention no more frequently than weekly during continuous operation. Lubrication systems shall not require attention during startup or shutdown and shall not waste lubricants.

B. Lubricants of the types recommended by the equipment manufacturer shall be provided in sufficient quantities to fill all lubricant reservoirs and to replace all consumption during testing, startup, and operation prior to acceptance of equipment by Owner. Lubricants for equipment where the lubricants may come in contact with water before or during a potable water treatment process or with potable water, shall be food grade lubricants. This includes lubricants for equipment not normally in contact with water, but where accidental leakage of the lubricants may contaminate the water.

C. Lubrication facilities shall be convenient and accessible. Oil drains and fill openings shall be easily accessible from the normal operating area or platform. Drains shall allow for convenient collection of waste oil in containers from the normal operating area or platform without removing the unit from its normal installed position.

1.7 ELEVATION.

A. The elevation of the site shall be as indicated in the Meteorological and Seismic Design Criteria section. All equipment furnished shall be designed to meet stipulated conditions and to operate satisfactorily at the specified elevation.

1.8 ELECTRIC MOTORS.

A. Unless otherwise specified, motors furnished with equipment shall meet the requirements specified in Common Motor Requirements for Process Equipment section or specified in specific equipment sections.

1.9 DRIVE UNITS.

A. The nominal input horsepower rating of each gear or speed reducer shall be at least equal to the nameplate horsepower of the drive motor. Drive units shall be designed for 24 hour continuous service.

B. Gearmotors.

1. The use of gearmotors sharing an integral housing or cutgears into the motor output shaft, or that require removal of lubricant from the gear reducer to change out the motor will not be acceptable.

C. Gear Reducers.

1. Each gear reducer shall be a totally enclosed unit with oil or grease lubricated, rolling element, antifriction bearings throughout.

D. Unless superseded by individual specification requirements each helical, spiral bevel, combination bevel-helical, and worm gear reducers shall have a service factor of at least 1.50 based on the nameplate horsepower of the drive motor. Cycloidal gear reducers shall have a service factor of at least 2.0 based on the nameplate horsepower of the drive motor. Shaft-mounted and flange-mounted gear reducers shall be rated AGMA Class III. Helical gear reducers shall have a gear strength rating to catalog rating of 1.5. Each gear reducer shall be designed and manufactured in compliance with applicable most current AGMA standards, except the L_{10} bearing life shall be 200, 000 hours.

E. The thermal horsepower rating of each unit shall equal or exceed the nameplate horsepower of the drive motor. During continuous operation, the maximum sump oil temperature shall not rise more than 100°F above the ambient air temperature in the vicinity of the unit and shall not exceed 200°F .

F. Each grease lubricated bearing shall be installed in a bearing housing designed to facilitate periodic regreasing of the bearing by means of a manually operated grease gun. Each bearing housing shall be designed to evenly distribute new grease, to properly dispose of old grease, and to prevent overgreasing of the bearing. The use of permanently sealed, grease lubricated bearings will not be acceptable in large sized reducers. In small reducers, similar to basin equipment, permanently sealed grease lubricated bearings rated L_{10} 200,000 hour life may be provided at the manufacturer's option. An internal or external oil pump and appurtenances shall be provided if required to properly lubricate oil lubricated bearings. A dipstick or a sight glass arranged to permit visual inspection of lubricant level shall be provided on each unit.

G. Gear reducers which require the removal of parts or the periodic disassembly of the unit for cleaning and manual regreasing of bearings will not be acceptable.

H. Certification shall be furnished by the gear reducer manufacturer indicating that the intended application of each unit has been reviewed in detail by the manufacturer and that the unit provided is fully compatible with the conditions of installation and service.

1.10 SAFETY GUARDS.

A. All belt or chain drives, fan blades, couplings, and other moving or rotating parts shall be covered on all sides by a safety guard. Safety guards shall be fabricated from 16 USS gage thick or thicker galvanized, aluminum-clad sheet steel, or stainless sheet steel or from 1/2 inch mesh galvanized expanded metal, or pultrusion molded UV resistant materials. Each safety guard shall be reinforced or shaped to provide suitable strength to prevent vibration and deflection and shall comply with OSHA. Each guard

shall be designed for easy installation and removal. All necessary supports and accessories shall be provided for each guard. Supports and accessories, including bolts, shall be galvanized. All safety guards in outdoor locations shall be designed to prevent the entrance of rain and dripping water.

1.11 ANCHOR BOLTS.

A. Equipment suppliers shall design and detail suitable anchor bolts for each item of equipment. Anchor bolts shall be designed for all operating conditions of the equipment, including wind and seismic loadings when applicable. Wind and seismic loads shall be as indicated in the Meteorological and Seismic Design Criteria section.

B. Requirements for anchor bolt type, material, and minimum diameter shall be as indicated in the Anchorage in Concrete and Masonry section.

C. Anchor bolts, together with templates or setting drawings, shall be delivered sufficiently early to permit setting the anchor bolts when the structural concrete or masonry grout is placed.

D. Unless otherwise indicated or specified, anchor bolts for items of equipment mounted on baseplates shall be long enough to permit 1-1/2 inches of grout beneath the baseplate and to provide adequate anchorage into structural concrete.

1.12 EQUIPMENT BASES.

A. Unless otherwise indicated or specified, all equipment shall be installed on concrete bases at least 6 inches . Cast iron or welded steel baseplates shall be provided for equipment as needed. Each unit and its drive assembly shall be supported on a single baseplate of neat design. Baseplates shall have pads for anchoring all components, and adequate grout holes. Baseplates shall be anchored to the concrete base with suitable anchor bolts and the space beneath filled with grout as specified in the Grouting section.

1.13 SPECIAL TOOLS AND ACCESSORIES.

A. Equipment requiring periodic repair and adjustment shall be furnished complete with all special tools, instruments, and accessories required for proper maintenance. Equipment requiring special devices for lifting or handling shall be furnished complete with those devices.

1.14 SHOP PAINTING.

A. All iron and steel surfaces of the equipment shall be protected with suitable protective coatings applied in the shop. Surfaces of the equipment that will be inaccessible after assembly shall be protected for the life of the equipment. Coatings shall be suitable for the environment where the equipment is installed. Exposed surfaces shall be finished, thoroughly cleaned, and filled as necessary to provide a smooth, uniform base for

painting. Electric motors, speed reducers, starters, and other self-contained or enclosed components shall be shop primed or finished with an epoxy or polyurethane enamel or universal type primer suitable for top coating in the field with a universal primer and aliphatic polyurethane system.

B. Surfaces to be coated after installation shall be prepared for painting as recommended by the paint manufacturer for the intended service, and then shop painted with one or more coats of a universal primer.

C. Machined, polished, and nonferrous surfaces which are not to be painted shall be coated with rust-preventive compound as recommended by the equipment manufacturer.

1.15 PREPARATION FOR SHIPMENT.

A. Equipment shall be prepared for shipment as specified in the Product Delivery Requirements section.

1.16 STORAGE.

A. Handling and storage of equipment shall be as specified in the Product Storage and Handling Requirements section.

1.17 INSTALLATION AND OPERATION.

A. Installation and operation shall be as specified in respective equipment sections and the Startup Requirements section.

1.18 OBSERVATION OF PERFORMANCE TESTS.

A. Where the Specifications require the presence of Engineer, initial tests shall be observed or witnessed by Engineer. Owner shall be reimbursed by Contractor for all costs of subsequent visits by Engineer to witness or observe incomplete tests, retesting, or subsequent tests.

1.19 PROGRAMMING SOFTWARE.

A. Programming software shall be provided for any equipment which includes a programmable logic controller (PLC) or other digital controller that is user-programmable.

B. The software shall be suitable for loading and running on a laptop personal computer operating with a Windows-based operating system.

C. A copy of the manufacturer's original operating logic program shall be provided for use in maintaining and troubleshooting the equipment.

D. Where multiple pieces of equipment, from the same or different vendors, use the same programming software, only one copy of the software need be provided.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

End of Section

SECTION 01611 - METEOROLOGICAL AND SEISMIC DESIGN CRITERIA

PART 1 - GENERAL

1.1 SCOPE

A. Non-structural components shall be designed in accordance with this section. In the event of conflict with requirements in other sections, the more stringent criteria shall be followed.

1.2 DESIGN CRITERIA.

A. **[**Non-structural components including anchorage of such items, shall be designed in accordance with the following criteria.

1. General Design Data		
	Building code and references	IBC 2021, ASCE 7-16 “Minimum Design Loads and Associated Criteria for Buildings and Other Structures”, AISC 360 “Specification for Structural Steel Buildings”, AISC 341 “Seismic Provisions for Structural Steel Buildings”
	Site elevation, above mean sea level (ft)	See Site Plan
	Design flood elevation (ft)	760.00 (500 year)
	Design groundwater elevation (ft)	See Geotechnical Report
2. Wind Design Data		
	Basic (Ultimate) design wind speed, V (mph)	117
	Exposure category	C
	Ground elevation factor, K_e	1.0
3. Snow Design Data		
	Ground snow load, P_g (psf)	20
	Exposure factor (C_e)	1.10
4. Ice Design Data		
	Nominal ice thickness, t (in)	1.5
	Concurrent wind speed, V_c (mph)	40

5. Seismic Design Data		
	Mapped MCE short period spectral response acceleration, S_S (g)	0.094
	Mapped MCE one second period spectral response acceleration, S_1 (g)	0.069
	Design short period spectral response acceleration, S_{DS} (g)	0.1
	Design one second period spectral response acceleration, S_{D1} (g)	0.11
	Risk Category	III
	Non-Structural Components Importance Factor, I_P	As indicated in the Non-Structural Components Schedule
	Non-Structural Components Seismic Design Category	II

1.3 WIND ANCHORAGE

A. Equipment that is to be located outdoors shall have anchor bolts designed for the effects of wind forces, as determined in accordance with ASCE 7, Chapters 26-31.

B. Design of anchorage shall be in accordance with the Anchorage in Concrete and Masonry section.

1.4 SEISMIC DESIGN

A. General.

1. Structural systems shall provide continuous load paths, with adequate strength and stiffness to transfer all seismic forces from the point of application to the point of final resistance.

B. Non-Structural Components.

1. Non-structural components are architectural, mechanical, and electrical items that are permanently attached to and supported by a structure but are not part of the structural system, as indicated in Chapter 13 of ASCE 7. The Non-Structural Components Schedule identifies the components that require seismic design. The requirements of this paragraph are applicable only to the items listed in the Non-Structural Components Schedule.

2. General

a. Design of non-structural components shall be in accordance with all applicable provisions of ASCE 7, Chapter 13.
b. "W_p" shall include the total operating weight of the component or system, including, but not limited to, any insulation, fluids, and concentrated loads such as valves, condensate traps, and similar components.

3. Submerged Components

a. Components that are to be submerged in water shall be designed to withstand loads from the effects of water sloshing during the seismic event.
b. The calculation of the sloshing effects shall be in accordance with the latest edition of ACI 350.3.

4. Anchorage Design

a. Every component in the Non-Structural Components Schedule shall have its anchorage to the supporting structure designed in accordance with ASCE 7, Chapter 13.
b. Design of anchorage shall be in accordance with the Anchorage in Concrete and Masonry section.
c. Components shall be attached so that seismic forces are transferred to the structural system. Curbs that support roof-mounted equipment shall be designed to transfer forces from the equipment into the main structural roof members. All structural attachments shall be bolted, welded, or otherwise positively fastened. Frictional resistance due to gravity shall not be considered in evaluating the required resistance to seismic forces.

5. Component Design

a. Every component in the Non-Structural Components Schedule shall be designed for seismic conditions in accordance with ASCE 7, Chapter 13.
b. Components shall have sufficient strength and ductility to resist the specified seismic effects, and shall meet all of the design, proportioning, detailing, inspection, and quality assurance provisions of the specified building code and other referenced codes. Components shall be designed to be operable during and following a design level seismic event without collapsing, breaking away from supports, creating an ignition hazard, or releasing any contents.
c. Seismic effects that shall be analyzed in the design of piping systems include the dynamic effects of the piping system, contents, and supports. The interaction between piping systems and the supporting structures, including other mechanical and electrical equipment, shall also be considered. Where pipe supports are to be designed by Contractor, as required by the Pipe Supports section, both the piping and support systems shall be designed to meet the applicable requirements of ASCE 7, Chapter 13.

6. Seismic Certification

a. Design of components and their anchorage shall be certified by one of the following methods.
   1) Analysis and design by a design professional registered in the state of the project. Certification by analysis shall be permitted only for nonactive components, and shall be based on seismic demand considering R_p/I_p equal to 1.0.
   2) Shake table testing based upon a nationally recognized testing standard procedure, such as ICC-ES AC 156, acceptable to the authority having jurisdiction.
   3) Experience data, based upon nationally recognized procedures acceptable to the authority having jurisdiction.

b. Components indicated in the Non-Structural Components Schedule to require special seismic certification shall be certified only by methods 2 or 3 above, except that certification for containment of hazardous materials may be by any of the three methods.

7. Construction Documents

   a. Construction documents (fabrication or shop drawings) of non-structural components shall be sealed by a design professional that is registered in the state of the Missouri.
   b. Documents shall be sealed whether the basis for certification is analysis and design, shake table testing, or experience data.
   c. The sealing method shall clearly indicate that the component and its anchorage have been designed for the code required seismic forces.

8. Submittals

   a. The construction documents, structural design calculations, shake table certification, and experience data certification, as applicable, shall be submitted in accordance with the Submittal Procedures section.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

End of Section

Non-Structural Components Schedule			
Component	Applicable Specification Section	Importance Factor (I_p)	Special Seismic Certification Required
Floor Access Doors and Hatches	02610		
Vertical Well Submersible Pumps	11145	1.0	
Piping Systems and Related Pipe Supports			
Raw Water Piping	15061	1.0	
Pipe Supports	15140	1.0	
Power Panels	16050	1.0	
Separately Enclosed Motor Starters	16050	1.0	
Control Stations	16050	1.0	
Separately Enclosed Circuit Breakers	16050	1.0	
Disconnect Switches	16050	1.0	
Power Centers	16050	1.0	
Common Motor Requirements for Process Equipment	16220	1.0	

Note: Some specification sections listed in the Non-Structural Components Schedule cover multiple items. Within those sections, some components may be exempt from seismic design based on their weight and/or their height above the floor. Reference ASCE 7, Paragraph 13.1.4 for specific conditions of the exemptions. Some distribution systems such as conduit, cable tray, raceways, duct systems, and piping and tubing systems may also be exempt from seismic design based on their loads and support mechanisms as indicated in their respective paragraphs in ASCE 7, Chapter 13.

SECTION 01612 - PRODUCT DELIVERY REQUIREMENTS

PART 1 - GENERAL

1.1 SCOPE.

A. This section covers packaging and shipping of materials and equipment.

1.2 PREPARATION FOR SHIPMENT.

A. All equipment shall be suitably packaged to facilitate handling and to protect against damage during transit and storage. All equipment shall be boxed, crated, or otherwise completely enclosed and protected during shipment, handling, and storage. All equipment shall be protected from exposure to the elements and shall be kept dry at all times.

B. Painted and coated surfaces shall be protected against impact, abrasion, discoloration, and other damage. Painted and coated surfaces which are damaged prior to acceptance of equipment shall be repainted to the satisfaction of Engineer.

C. Grease and lubricating oil shall be applied to all bearings and similar items.

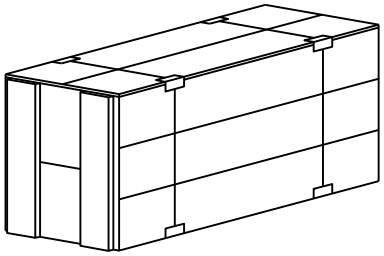
1.3 SHIPPING.

A. Before shipping each item of equipment shall be tagged or marked as identified in the delivery schedule or on the Shop Drawings. Complete packing lists and bills of material shall be included with each shipment.

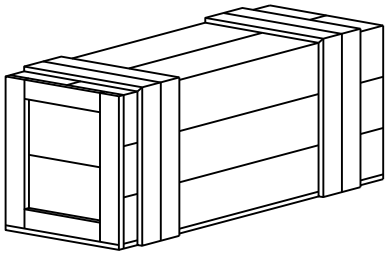
PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

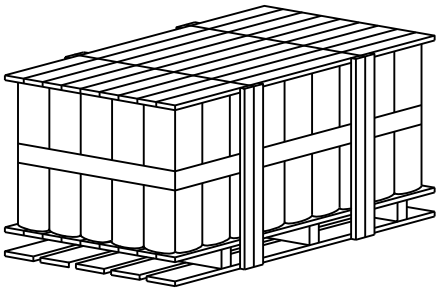
End of Section



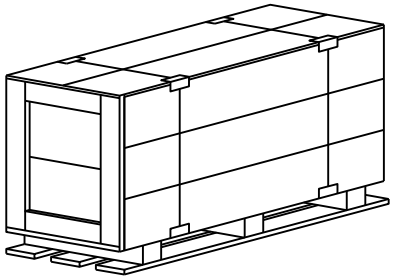
STYLE 4



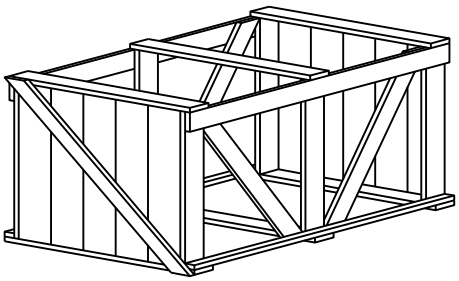
STYLE 2
(BANDED)



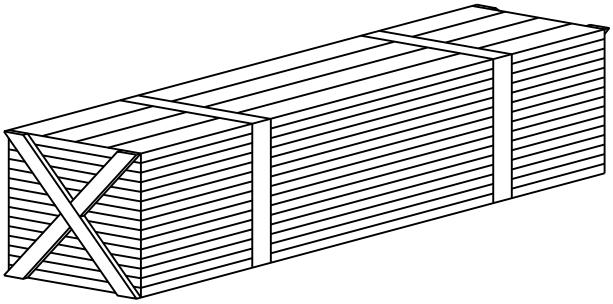
STYLE X



STYLE 2
(PALLETIZED)



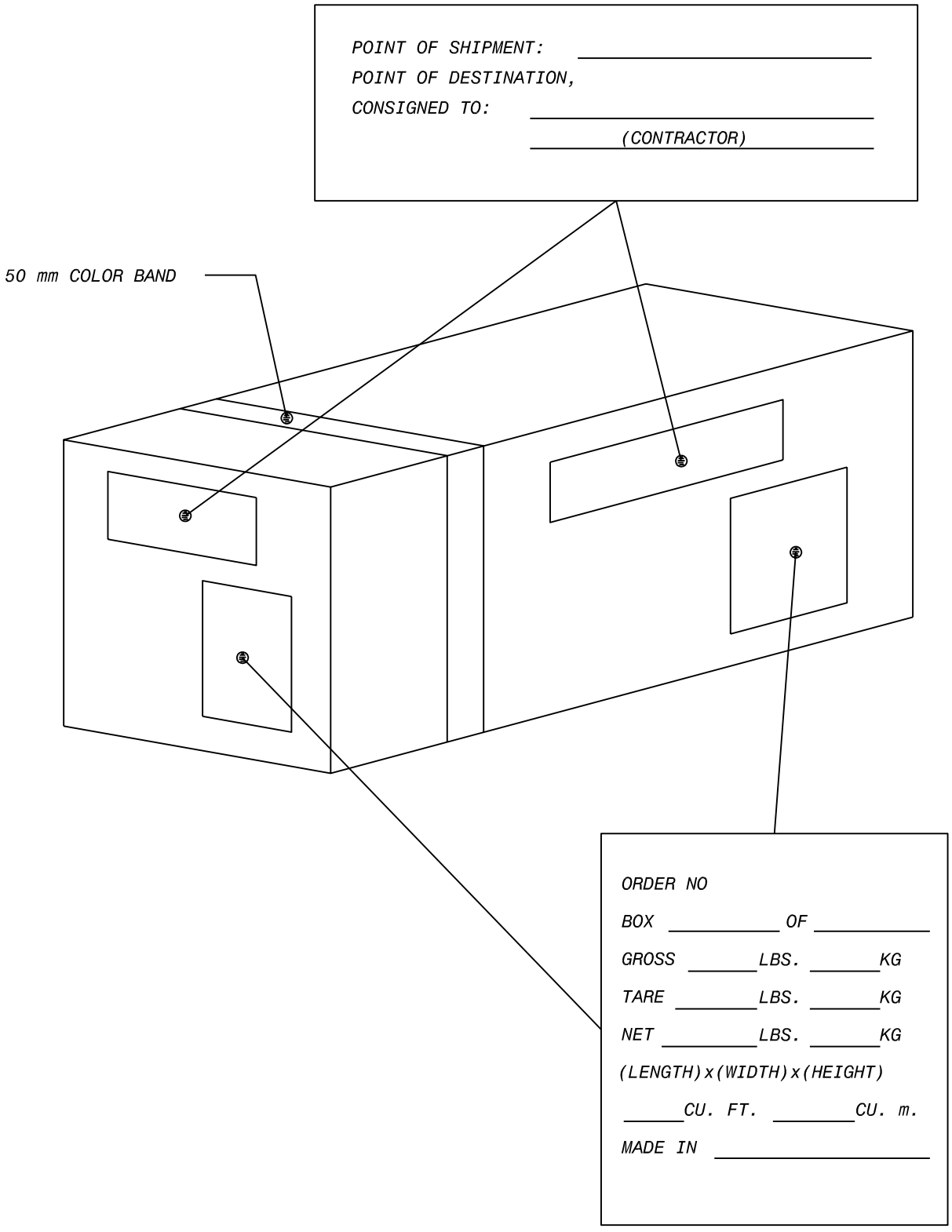
OPEN CRATE



STRAPPING 1 3/8" (35 mm)
SPACED ON 24" (600 mm) CTRS.
WITH CORNER PLATES.

EXPORT SHIPMENT PACKING INSTRUCTIONS

BLACK & VEATCH	PRODUCT DELIVERY REQUIREMENTS	FIG 1-01612



MARKING INSTRUCTIONS

BLACK & VEATCH		FIG 2-01612

SECTION 01614 - PRODUCT STORAGE AND HANDLING REQUIREMENTS

PART 1 - GENERAL

1.1 SCOPE.

A. This section covers delivery, storage, and handling of materials and equipment.

1.2 DELIVERY.

A. Contractor shall bear the responsibility for delivery of equipment, spare parts, special tools, and materials to the site and shall comply with the requirements specified herein and shall provide required information concerning the shipment and delivery of the materials specified in this Contract. These requirements also apply to any subsuppliers making direct shipments to the Site.

B. Contractor shall, either directly or through contractual arrangements with others, accept responsibility for the safe handling and protection of the equipment and materials furnished under this Contract before and after receipt at the port of entry. Acceptance of the equipment shall be made after it is installed, tested, placed in operation and found to comply with all the specified requirements.

C. All items shall be checked against packing lists immediately on delivery to the site for damage and for shortages. Damage and shortages shall be remedied with the minimum of delay.

D. Delivery of portions of the equipment in several individual shipments shall be subject to review of Engineer before shipment. When permitted, all such partial shipments shall be plainly marked to identify, to permit easy accumulation, and to facilitate eventual installation.

1.3 STORAGE.

A. Upon delivery, all equipment and materials shall immediately be stored and protected until installed in the Work.

B. Stacked items shall be suitably protected from damage by spacers or load distributing supports that are safely arranged. No metalwork (miscellaneous steel shapes and reinforcing steel) shall be stored directly on the ground. Masonry products shall be handled and stored in a manner to hold breakage, chipping, cracking, and spalling to a minimum. Cement, lime, and similar products shall be stored off the ground on pallets and shall be covered and kept completely dry at all times. Pipe, fittings, and valves may be stored out of doors, but must be placed on wooden blocking. PVC pipe, geomembranes, plastic liner, and other plastic materials shall be stored off the ground on pallets and protected from direct sunlight.

C. Pumps, motors, electrical equipment, and all equipment with antifriction or sleeve bearings shall be stored in weathertight structures maintained at a temperature above 60°F. Electrical equipment, controls, and insulation shall be protected against moisture and water damage. All space heaters furnished in equipment shall be connected and operated continuously.

D. Equipment having moving parts, such as gears, bearings, and seals, shall be stored fully lubricated with oil, grease, etc., unless otherwise instructed by the manufacturer. Manufacturer's storage instructions shall be carefully followed by Contractor.

E. When required by the equipment manufacturer, moving parts shall be rotated a minimum of twice a month to ensure proper lubrication and to avoid metal to metal "welding". Upon installation of the equipment, Contractor shall, at the discretion of Engineer, start the equipment at one-half load for an adequate period of time to ensure that the equipment does not deteriorate from lack of use.

F. When required by the equipment manufacturer, lubricants shall be changed upon completion of installation and as frequently as required thereafter during the period between installation and acceptance. New lubricants shall be put into the equipment by Contractor at the time of acceptance.

G. Equipment and materials shall not show any pitting, rust, decay, or other deleterious effects of storage when installed in the Work.

H. In addition to the protection specified for prolonged storage, the packaging of spare units and spare parts shall be for export packing and shall be suitable for long-term storage in a damp location. Each spare item shall be packed separately and shall be completely identified on the outside of the container.

1.4 HANDLING.

A. Stored items shall be laid out to facilitate their retrieval for use in the Work. Care shall be taken when removing the equipment for use to ensure the precise piece of equipment is removed and that it is handled in a manner that does not damage the equipment.

B. During handling, carbon steel constructed material including chains, straps, and forks on lifting equipment shall not directly contact any equipment or material constructed of stainless steel. It shall be the Contractor’s responsibility to correct any carbon steel contamination of stainless steel.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

End of Section

SECTION 01615 - EQUIPMENT AND VALVE IDENTIFICATION

PART 1 - GENERAL

1.1 SCOPE.

A. This section covers the furnishing and installation of nameplates and tags for identification of wells, equipment, valves, panels, and instruments.

1.2 GENERAL.

A. Except as otherwise specified in equipment, valve, and instrumentation sections, nameplates and tags shall be as specified herein. Nameplates or tags shall be provided for all vertical well pitless adapters, equipment, valves, operator interfaces, control and electrical panels, cabinets, instruments, and instrument racks that have been named and/or tagged on the Drawings.

1.3 SUBMITTALS.

A. Drawings and Data

1. Drawings and data shall be submitted in accordance with the requirements of the Submittals Procedures section for each type of tag provided including materials, colors, sizes, letter sizes, and installation instructions.

PART 2 - PRODUCTS

2.1 PITLESS ADAPTER INFORMATION PLATES

A. Each pitless adapter shall have an information plate placed on the extension riser above grade.

B. Pitless adapters shall be provided with engraved or stamped equipment information plates securely affixed with mechanical fasteners to the equipment in an accessible and visible location.

C. Pitless adapter information plates shall be in addition to the number plates specified.

D. Pitless adapter information plates shall indicate the manufacturer’s name, address, product name, catalog number, serial number, capacity, operating and power characteristics, labels of tested compliances, and any other pertinent design data.

E. Equipment information plates listing the distributing agent only will not be acceptable.

2.2 EQUIPMENT NUMBER PLATES.

A. All equipment tagged on the drawings, except for submerged equipment shall be provided with number plates bearing the equipment tag number identified on the Drawings.

B. Number plates shall be bevelled, 1/8th inch thick laminated black phenolic plastic engraving stock with white core. Lettering on number plates shall be capitalized block letters ¾ inch high.

C. Number plate height shall be twice the letter height. Number plate length shall be as needed, with suitable margins all around.

D. Lettering shall be placed in one row where practicable; however, where necessary due to excessive length, lettering shall be placed on more than one row and centered.

E. Number plates shall be attached with stainless steel panhead screws, rivets, or drive screws.

F. When a number plate cannot be installed due to the physical size, space, or mounting surface geometry of the equipment, the Contractor shall provide a 12 gauge stainless steel tag with engraved or imprinted equipment tag number. Lettering on tags shall be ¼ inch high. Tags shall be rectangular with smooth edges and shall be fastened to the equipment with stainless steel mechanical fasteners or with a stainless-steel chain.

2.3 EQUIPMENT INFORMATION PLATES.

A. Equipment shall be provided with engraved or stamped equipment information plates securely affixed with mechanical fasteners to the equipment in an accessible and visible location.

B. Equipment information plates shall be in addition to the number plates specified.

C. Equipment information plates shall indicate the manufacturer's name, address, product name, catalog number, serial number, capacity, operating and power characteristics, labels of tested compliances, and any other pertinent design data.

D. Equipment information plates listing the distributing agent only will not be acceptable.

2.4 VALVE TAGS.

A. Temporary Tags.

1. Each valve with an identifying number indicated on the Drawings or listed in the valve schedule, shall be tagged or marked in the factory with the identifying number.

B. Permanent Tags.

1. All valves, except buried or submerged valves, that have been assigned a number on the Drawings or in the valve schedule, shall be provided with a permanent number plate.

2. Tags shall be permanently attached to valves with stainless steel mechanical fasteners or with stainless steel chains. Numerals shall be ¾ inch high and shall be black baked enamel on an anodized aluminum plate.

2.5 PANEL NAMEPLATES.

A. Nameplates shall be provided on the face of each panel and cabinet. Panel identification nameplates shall be mounted at the top of the panel shall include the panel descriptive name and tag number as indicated on the Drawings, in two or three lines of text. Lettering shall be ¾ inch high.

B. Nameplates for devices mounted on or in the panel shall be inscribed with the text as indicated on the Drawings. Where nameplate information is not indicated on the Drawings, inscriptions shall be in accordance with information in the supplier's submittal drawings as guided by information in the relevant specification section. Panel device nameplates shall have engraved letters 3/16 inch high.

C. Nameplate material and size shall be as specified above for equipment number plates. Nameplates shall be secured to the panel with stainless steel panhead screws.

2.6 INSTRUMENT TAGS.

A. Temporary Tags.

1. Where instruments are not provided with permanent tags furnished from the factory, instruments shall be tagged or marked in the factory with the instrument tag number indicated on the Drawings.

B. Permanent Tags.

1. Instruments shall be tagged with the instrument tag number indicated on the Drawings. Tags shall be 12 gauge stainless steel with engraved or imprinted symbols. Lettering on tags shall be ¼ inch high. Tags shall be rectangular with smooth edges, and shall be fastened to the instrument with stainless steel mechanical fasteners or with a stainless-steel chain.

PART 3 - EXECUTION (NOT USED)

End of Section

SECTION 01615 - EQUIPMENT AND VALVE IDENTIFICATION

PART 1 - GENERAL

1.1 SCOPE.

A. This section covers the furnishing and installation of nameplates and tags for identification of wells, equipment, valves, panels, and instruments.

1.2 GENERAL.

A. Except as otherwise specified in equipment, valve, and instrumentation sections, nameplates and tags shall be as specified herein. Nameplates or tags shall be provided for all vertical well pitless adapters, equipment, valves, operator interfaces, control and electrical panels, cabinets, instruments, and instrument racks that have been named and/or tagged on the Drawings.

1.3 SUBMITTALS.

A. Drawings and Data

1. Drawings and data shall be submitted in accordance with the requirements of the Submittals Procedures section for each type of tag provided including materials, colors, sizes, letter sizes, and installation instructions.

PART 2 - PRODUCTS

2.1 PITLESS ADAPTER INFORMATION PLATES

A. Each pitless adapter shall have an information plate placed on the extension riser above grade.

B. Pitless adapters shall be provided with engraved or stamped equipment information plates securely affixed with mechanical fasteners to the equipment in an accessible and visible location.

C. Pitless adapter information plates shall be in addition to the number plates specified.

D. Pitless adapter information plates shall indicate the manufacturer’s name, address, product name, catalog number, serial number, capacity, operating and power characteristics, labels of tested compliances, and any other pertinent design data.

E. Equipment information plates listing the distributing agent only will not be acceptable.

2.2 EQUIPMENT NUMBER PLATES.

A. All equipment tagged on the drawings, except for submerged equipment shall be provided with number plates bearing the equipment tag number identified on the Drawings.

B. Number plates shall be bevelled, 1/8th inch thick laminated black phenolic plastic engraving stock with white core. Lettering on number plates shall be capitalized block letters ¾ inch high.

C. Number plate height shall be twice the letter height. Number plate length shall be as needed, with suitable margins all around.

D. Lettering shall be placed in one row where practicable; however, where necessary due to excessive length, lettering shall be placed on more than one row and centered.

E. Number plates shall be attached with stainless steel panhead screws, rivets, or drive screws.

F. When a number plate cannot be installed due to the physical size, space, or mounting surface geometry of the equipment, the Contractor shall provide a 12 gauge stainless steel tag with engraved or imprinted equipment tag number. Lettering on tags shall be ¼ inch high. Tags shall be rectangular with smooth edges and shall be fastened to the equipment with stainless steel mechanical fasteners or with a stainless-steel chain.

2.3 EQUIPMENT INFORMATION PLATES.

A. Equipment shall be provided with engraved or stamped equipment information plates securely affixed with mechanical fasteners to the equipment in an accessible and visible location.

B. Equipment information plates shall be in addition to the number plates specified.

C. Equipment information plates shall indicate the manufacturer's name, address, product name, catalog number, serial number, capacity, operating and power characteristics, labels of tested compliances, and any other pertinent design data.

D. Equipment information plates listing the distributing agent only will not be acceptable.

2.4 VALVE TAGS.

A. Temporary Tags.

1. Each valve with an identifying number indicated on the Drawings or listed in the valve schedule, shall be tagged or marked in the factory with the identifying number.

B. Permanent Tags.

1. All valves, except buried or submerged valves, that have been assigned a number on the Drawings or in the valve schedule, shall be provided with a permanent number plate.

2. Tags shall be permanently attached to valves with stainless steel mechanical fasteners or with stainless steel chains. Numerals shall be ¾ inch high and shall be black baked enamel on an anodized aluminum plate.

2.5 PANEL NAMEPLATES.

A. Nameplates shall be provided on the face of each panel and cabinet. Panel identification nameplates shall be mounted at the top of the panel shall include the panel descriptive name and tag number as indicated on the Drawings, in two or three lines of text. Lettering shall be ¾ inch high.

B. Nameplates for devices mounted on or in the panel shall be inscribed with the text as indicated on the Drawings. Where nameplate information is not indicated on the Drawings, inscriptions shall be in accordance with information in the supplier's submittal drawings as guided by information in the relevant specification section. Panel device nameplates shall have engraved letters 3/16 inch high.

C. Nameplate material and size shall be as specified above for equipment number plates. Nameplates shall be secured to the panel with stainless steel panhead screws.

2.6 INSTRUMENT TAGS.

A. Temporary Tags.

1. Where instruments are not provided with permanent tags furnished from the factory, instruments shall be tagged or marked in the factory with the instrument tag number indicated on the Drawings.

B. Permanent Tags.

1. Instruments shall be tagged with the instrument tag number indicated on the Drawings. Tags shall be 12 gauge stainless steel with engraved or imprinted symbols. Lettering on tags shall be ¼ inch high. Tags shall be rectangular with smooth edges, and shall be fastened to the instrument with stainless steel mechanical fasteners or with a stainless-steel chain.

PART 3 - EXECUTION (NOT USED)

End of Section

SECTION 01650 - COMMISSIONING

PART 1 - GENERAL

1.1 SCOPE.

A. This section includes the requirements for startup and testing all items of equipment and systems that form a part of this Contract.

B. The purpose of this section is to define the requirements for bringing individual equipment, systems, and facilities online and for proving proper operation and performance of that Work.

C. Contractor is required to develop, submit, and maintain detailed plans, including designation of management and staff, for these activities as specified herein.

D. Additional requirements such as disinfection and training are specified in other sections.

E. The startup, testing, and commissioning services referenced or specified herein include the following:

1. Startup and Testing

    a. Startup checks
    b. Functional testing

2. Functional acceptance testing

3. Commissioning

4. Operation acceptance testing

5. Performance testing

F. Definitions.

1. Startup and Testing is the transitional phase between completion of construction and start of commissioning and includes the following:

    a. Pre-Startup Activities and Checks - Inspections, tests and other activities necessary to determine that equipment, systems and subsystems have been properly manufactured and installed. Pre-startup activities shall include an audit of all factory testing of equipment and compiling the results for comparison to startup and commissioning testing.
    b. Functional Testing – Initial limited operation of equipment, to demonstrate capability of installed components to perform their intended functions, respond to controls, and safely interface with external systems, followed by

operation of individual systems in manual and automatic mode to test full functionality of individual systems.

c. Commissioning - The establishment of the treatment processes for the plant.

d. Operational acceptance testing - Continuous testing of complete the treatment processes under specified operating conditions in accordance with the technical Specifications and applicable regulations to demonstrate proper performance of the facility.

e. Performance testing - When specified, continuous testing in accordance with the requirements of the Contract Documents.

1.2 GENERAL.

A. The Contractor shall be responsible for and furnish all labor, materials, instruments, incidentals, and equipment required for startup, testing, and commissioning.

B. Temporary facilities required to carry out the specified testing, including temporary pipe, pumps, and other appurtenances, shall be furnished and installed, and removed when no longer required for startup, testing, and commissioning. Refer to the Temporary Facilities section for requirements concerning water and power for startup and testing.

C. Startup and testing shall be conducted during normal working hours during the workweek of Monday through Friday, unless otherwise approved by the Owner.

D. Where continuous long-term testing is required, testing may continue over the weekends and holidays with prior approval from the Owner.

1.3 Constraints.

A. Startup and testing shall be conducted in a manner that does not compromise operation of the existing facilities or the quality of treated products released from the facility.

B. Any startup and testing activities affecting operation of the existing facilities shall be coordinated with the Owner and shall be shown on the Progress Schedule. The Owner will cooperate with the Contractor to the extent possible, but will have sole authority in decisions affecting existing operations.

C. The minimum constraints for startup and testing include the following:

1. During test pumping of the wells, all waste raw water shall be pumped onto a vegetated area a sufficient distance from the river to allow for complete infiltration. If discharge to a vegetated area is not feasible, the wastewater should be discharged into a sediment filter bag or into a temporary detention/retention pond with sufficient retention time to permit for the settling of all suspended solids.

2. Waste raw water, including treated or test water that cannot be delivered to the plant effluent system for any reason, shall be disposed of at the expense of the

Contractor, in a manner acceptable to the Owner, and in accordance with all laws, regulations, and permits.

1.4 STARTUP MANAGER, STARTUP TEAM, AND MANUFACTURER'S FIELD SERVICES REPRESENTATIVES.

A. The Contractor shall maintain a dedicated startup team led by a startup manager. The individual to be designated as startup manager shall be identified within 45 days of the Notice to Proceed and will be reviewed by Owner and Engineer. Once accepted, the Contractor shall not change the startup manager throughout the full period of performance of the Work without written permission of the Owner. Once engaged in the Project, the startup manager shall attend regular construction progress meetings. No startup activities shall begin until the startup manager has arrived at the jobsite.

B. The startup manager shall be on Site full time at least 30 days prior to any field startup and testing activities and shall remain on site until all startup, testing, and commissioning activities are complete.

C. Startup Manager.

The startup manager shall be a startup and testing expert with a minimum of 5 years of experience starting up equipment and systems of similar type, size, capacity, and complexity to the equipment and systems included in this Project. The startup manager shall have the necessary experience to fully understand all startup requirements, to manage the Contractor's resources providing the startup services, and to prepare all startup documentation, as specified. The startup manager's assigned duties and responsibilities are those specifically related to planning, supervising, and executing startup activities and shall include, but shall not be limited to the following:

a. Coordinating all testing and startup activities.
b. Preparing all startup and field testing plans, documentation, and forms.
c. Liaising between the Contractor, Engineer, and Owner for all startup and testing activities.
d. Developing a comprehensive schedule for all startup activities and providing regular schedule updates. The startup and testing schedule shall be incorporated into the Progress Schedule.
e. Scheduling and leading startup, testing, and commissioning planning meetings.
f. Conducting coordination meetings during startup, testing, and commissioning at least weekly.
g. Coordinating manufacturers' services and their certification of proper installation and/or operation of equipment as required by the Specifications.
h. Overseeing and administering all startup, testing, and commissioning activities, including either direct participation in the activities and/or oversight and monitoring of activities. It shall be the startup manager's responsibility to assure that all tests have been completed in accordance with accepted testing procedures.

i. Ensuring readiness for and coordinating maintenance, repair, and adjustment of equipment and systems during startup testing, and commissioning.
j. Conducting or overseeing pre-test checks to ensure readiness for testing.
k. Verify all piping hydrostatic testing and flushing has been completed prior to field testing connected equipment.
l. Ensuring all testing equipment is in proper working order and has been calibrated to appropriate standards.
m. Developing safe work policies and procedures including lockout/tagout procedures and personal protective equipment policies, that will be followed during all field startup and testing activities. At a minimum the Contractor shall comply with OSHA and the Owner's established safety guidelines. It shall be the startup manager's responsibility to assure all safety procedures are followed at all times.
n. Reviewing and approving all equipment training sessions prior to submission to Engineer, to assure that the training is compliant with the requirements of the Specifications and includes all applicable operation, maintenance, safety, functional, performance, and startup and testing information.
o. Organizing teams made up of qualified representatives of Suppliers, Subcontractors, and others, as appropriate, to efficiently and expeditiously startup and test the equipment and systems installed and constructed under this Contract. The objective of this program shall be to demonstrate to the Engineer and Owner that the structures, systems, and equipment constructed and installed under this Contract meet all performance requirements and the facility is ready for operation as intended. In addition, the testing program shall produce baseline operating conditions for the Owner to use in a preventive maintenance program.
p. Ensuring the development and maintenance of records documenting all startup, testing, and commissioning activity. The records shall be organized by major process system into organized files/binders and turned over to the Owner prior to applying for final payment. Testing records shall be accessible to the Engineer and Owner at all times to allow monitoring of the progress.
q. Ensuring the startup team is equipped and ready to make emergency repairs and adjustments to equipment installed and modified as part of the Project.
r. Scheduling and conducting a one day workshop with the Owner and Engineer to resolve submittal review comments to the Contractor's startup, testing, and commissioning plan submittal.
s. Notifying the Owner and all respective equipment manufacturers at least 21 days prior to the date when each equipment system is scheduled for pre-startup activities and checks.
t. Organize International Electrical Testing Association (NETA) acceptance testing in accordance with the Electrical Equipment Installation section.

D. Startup Team.

1. The startup team shall include the startup manager and all staff deemed necessary for successful completion of startup, testing, and commissioning. This will typically include engineers, major equipment vendors, operators, and representatives from the Instrumentation and Control System Supplier. Additional trade representatives may be included as project requirements dictate.

E. Manufacturer's Field Services Representative.

1. The manufacturers shall provide a technically qualified field-service representative for the installation, startup, and testing of equipment furnished, as specified in the equipment sections.

2. The manufacturer shall submit qualifications and experience records for all key personnel to be involved in startup activities.

3. The manufacturer's field services representative shall be employed full-time in installation, startup, and testing of similar equipment and facilities and work directly for the manufacturer.

4. The representative shall have conducted startup activities similar to those required herein on at least two other projects of similar complexity.

5. The Owner or Engineer shall have the right to reject the manufacturer's field services representative at any time, for immediate replacement by the manufacturer, if the accepted qualifications are not representative of the actual experience or abilities of the representative, as determined by the Owner or Engineer.

1.5 SUBMITTALS.

A. Startup Manager Qualifications

1. Startup manager's qualifications and past project experience including contact names, addresses and current telephone numbers of owner representatives that can be used to verify the accuracy of the information. Submittal shall be made at the preconstruction conference.

B. Manufacturer Representative Qualifications

1. Manufacturers' field services representative's qualifications and past project experience including contact names, addresses and current telephone numbers that can be used to verify the accuracy of the information. Qualification submittals shall be made 3 weeks before the manufacturer's representative is scheduled to be on Site.

C. Installation Certifications

1. Manufacturer's certification of proper installation of all equipment as specified in the equipment sections.

D. Plans and Schedules

1. Equipment and system startup, testing, and commissioning plans and schedule in accordance with the requirements of this section. Startup manager shall coordinate with Subcontractors and include their information in the startup and testing plan.

E. Field Calibration Results

1. Unless otherwise specified in the equipment sections, preliminary copies of field calibration results. Submittal shall be made prior to the start of each test for associated systems.

F. Daily logs.

G. General

1. Submittals shall be provided in accordance with the requirements of the Submittals Procedures section.

1.6 STARTUP AND TESTING REQUIREMENTS.

A. Startup Checks.

1. Prior to field testing of all equipment, the Contractor shall perform the following:

a. Inspect and clean equipment, devices, and connected piping so they are free of foreign material.
b. Lubricate equipment in accordance with manufacturer's instructions.
c. Turn rotating equipment by hand.
d. Open and close valves by hand and operate other devices to check for binding, interference, or improper functioning.
e. Test and commission related electrical system components in accordance with the requirements specified in the Electrical and the Electrical Equipment Installation sections.
f. Calibrate all instruments associated with the equipment.
g. Check for proper rotation, adjustment, alignment, balancing, mechanical and electrical connections, and any other conditions that may damage or impair equipment from functioning properly.
h. Inspect and verify proper anchorage.
i. Obtain manufacturer's certification of proper installation where specified in the equipment sections.

2. All equipment shall be confirmed ready to test by the Engineer based on the following:

a. Acceptance of Contractor's startup and testing plan.
b. Notification in writing by the startup manager that each piece of equipment or system is ready for testing.
c. Verification by the Engineer and Owner that all lubricants, tools, maintenance equipment, spare parts and approved equipment operation and maintenance manuals have been furnished as specified.
d. Cleanliness of equipment, devices, and connected work.
e. Adequate completion of work adjacent to or interfacing with equipment to be tested.
f. Confirmation of manufacturer's representative's availability to assist with testing, where specified, and satisfactory fulfillment of all other manufacturers' responsibilities as specified.
g. Engineer's inspection of all related civil construction, mechanical, and electrical installations.
h. Confirmation of completion of acceptable testing of all adjacent piping, duct work and other affected Work.
i. Completion of the factory acceptance testing of the PLC panels.

B. Functional Testing.

1. All startup checks shall be completed prior to functional testing. Functional testing shall be in accordance with relevant standards and in accordance with instructions of the manufacturers.

2. Ancillary and/or temporary facilities necessary to recycle, control, or discharge water, air, chemical, or gas from facilities being tested, shall be operational.

3. Functional testing shall include the functional operation of each piece of equipment. All moving parts of equipment and machinery shall be tested and adjusted so that they move freely and function satisfactorily. Functional testing shall demonstrate correct operation of all hardwired interlocks and controls.

4. Functional testing of power actuated valves shall include at least 4 full open-close operations. Testing shall demonstrate the maximum number of operations per hour as recommended by the actuator manufacturer without overheating.

5. Once functional testing of individual pieces of equipment is completed, individual systems functional testing shall commence. Individual system functional testing shall include startup of the complete system of mechanical, electrical, and instrumentation and control equipment as a functional process system. Field inspection prior to startup as specified in the Instrumentation and Control System section, other testing by the Instrumentation and Control System Supplier required to verify readiness for automatic operation of the individual system, shall be completed before commencement of individual system functional testing.

6. Individual system functional testing shall include operation in manual and automatic modes, startup operation, and shutdown in normal and emergency modes. Individual systems shall be tested over their entire operating range and for sufficient time to demonstrate the intended functionality of each piece of

equipment and the system. If any part of a system shows evidence of unsatisfactory or improper operation during the test period, correction or repairs shall be made and the functional testing shall be repeated until satisfactory results are obtained.

7. Functional testing of all process and pumping equipment and drive motors, including auxiliary equipment, shall be n accordance with the appropriate and approved test codes, such as those specified by the American Society of Mechanical Engineers, Hydraulic Institute Standards, and IEEE.

8. Qualified personnel from the electrical and mechanical trades responsible for installation of the equipment, shall be available during functional testing involving electrically operated equipment. Where appropriate, a representative of the Instrumentation and Control System Supplier shall also be available.

9. Specific requirements for individual system startup are as follows:

    a. Individual Well Testing (Disconnected from Main)
        1) Each well shall be tested individually to confirm proper operation. The contractor shall configure each well such that it can be pumped and discharged at the site. During test pumping of the wells, all wastewater should be pumped onto a vegetated area a sufficient distance from the river to allow for complete infiltration. If discharge to a vegetated area is not feasible, then wastewater should be discharged into a sediment filter bag or into a temporary detention/retention pond with sufficient retention time to permit for the settling of all suspended solids.
        2) For the individual pump tests, wells shall be pumped at the rate specified for each well.
        3) During test pumping, the following shall be recorded every 30 minutes, in addition to requirements specified elsewhere:
            a) Water level in the well and monitoring well
            b) Pressure readings at the discharge head
            c) Flow (in gpm)
        4) During test pumping, the water levels shall not decline to the intake of the pump. If water levels decline, pump test shall be suspended immediately until the problem can be resolved.

    b. Individual Well Testing (Connected to Main)
        1) Following completion of the individual well testing (disconnected from main), Contractor shall perform additional tests with the valve connecting the individual well discharge lines to the Raw Water Main open. Each well shall be tested individually to confirm proper operation.
        2) For the individual pump tests, wells shall be pumped at the rate specified for each well.
        3) During test pumping, the following shall be recorded every 30 minutes, in addition to requirements specified elsewhere, unless otherwise noted:

a) Water level in the well and monitoring well
b) Pressure readings at the discharge head
c) Flow (in gpm)
d) Pressure at the discharge point at the treatment plant (1 hour after initiation of the test and 1 hour before termination of the test)
e) Electrician shall take amp readings in the electrical control boxes to ensure there are no excessive loads on the pump motors

4) During test pumping, the water levels shall not decline to the intake of the pump. If water levels decline, pump test shall be suspended immediately until the problem can be resolved.

c. Multi-Well System Test (Connected to Main)

1) Following completion of the individual well testing (connected to main), there shall be a 7 day test period for a multi-well system test with the valve connecting the individual well discharge lines to the Raw Water Main open.
2) During this period, the Owner shall have full control of the new vertical wells and will operate with the remaining existing vertical wells in operation.
3) The Owner reserves the right to test the new wells under any condition during this test period.
4) During test pumping, the water levels shall not decline to the intake of the pump. If water levels decline, pump test shall be suspended immediately until the problem can be resolved by Contractor.

C. Functional Acceptance Testing.

1. Once the Contractor's functional testing is complete and associated documentation has been submitted and accepted by the Engineer, the Contractor shall conduct functional acceptance testing of each complete process system, to demonstrate individual systems meet the specified requirements. Acceptance testing shall include the successful demonstration of all operating functions and conditions that are specified for the equipment, system, and controls. The manufacturer's representative shall be on Site during acceptance testing when specified in the equipment specifications.

2. The Functional Acceptance Testing shall include the following submissions prior to commencement:

a. Prerequisite checklist, to be acknowledged by the Engineer prior to initiating the test, that demonstrates that all testing and other Work required to be completed prior to the test is complete.
b. Listing of Owner's personnel necessary to operate the system and conduct any related monitoring of performance.

c. A listing of Contractor's personnel designated to supervise and direct the Owner's operators as required herein.
d. Listing of standby personnel, equipment, and materials that will be available if needed during the test period.
e. Step-by-step procedures for operation of the facility showing how local and remote control of equipment will be demonstrated.
f. Description of all data and other information to be reported in support of the completed test. Include any blank data logs that may be used for recording results.
g. Descriptions of all necessary calculations that must be completed to verify the specified results are being achieved, including formulas.
h. Blank sign-off form for the test acknowledging the Contractor's, Engineer's, Owner's, and the equipment manufacturer's acceptance of the test.

3. Contractor shall provide Owner and Engineer 14 days notice prior to testing of any individual system.

4. Individual system acceptance testing shall continue for 48 hours without interruption for each system, and all parts shall operate satisfactorily in all respects under a range of conditions to simulate the full operating range of the equipment or system. If there are multiple parallel components or trains, then the testing duration will be 48 hours for each individual train.

5. If any part of a system shows evidence of unsatisfactory or improper operation during the testing period, correction or repairs shall be made and the test repeated until the test is successfully completed. Testing interrupted by power failure will not be required to be repeated, but the test shall be continued upon restoration of power and extended to the specified duration at no additional cost to the Owner.

6. During this testing period the Contractor shall operate all equipment.

1.7 COMMISSIONING.

A. Once startup and testing is complete; documentation of all startup and testing activities shall be submitted for reviewed and accepted by the Engineer.

B. After acceptance, commissioning of the constructed facilities shall be conducted by the Contractor working with the Owner and Engineer.

C. The facility shall be operated in accordance with the operating permit, laws, and regulations.

D. The Contractor shall provide mechanics, electricians, and controls technicians during commissioning as required for troubleshooting and repair.

1.8 STARTUP SCHEDULE AND STARTUP AND COMMISSIONING PLANS.

A. Plans and schedules shall be developed to facilitate coordinated and efficient startup, testing, and commissioning of the Project equipment and systems.

B. The Contractor shall submit a startup, testing, and commissioning plan and schedule to the Engineer no later than 90 calendar days prior to the commencement of startup and testing. A minimum of 21 days shall be allowed for review by Engineer and Owner. The schedule and plan must be accepted a minimum of 30 days prior to commencement of startup and testing. The schedule and plan shall include sections for startup checks, functional testing, functional acceptance testing, commissioning, operational acceptance testing, and performance testing.

C. Forms for startup and testing shall include identification of equipment or system, startup/test date, nature of startup/test, startup/test objectives, startup/test prerequisites, startup/test results, instruments employed for the startup/test and signature spaces for the Engineer's witness (where applicable) and the Contractor's startup manager.

D. Startup Schedule.

1. A startup schedule that provides an overall sequence and duration for all startup, testing and commissioning activities, shall be prepared and maintained.

2. This schedule shall serve as a companion to but shall not be a replacement for the startup plan. The startup schedule described in this section shall be integrated into the overall Progress Schedule and shall be prepared as specified for the Progress Schedule in the Construction Progress Schedule section.

3. The Startup Schedule shall be updated weekly to during the startup, testing, and commissioning period.

E. Startup Plan.

1. The Startup Plan shall include the following:

a. Introduction with a narrative description of the overall testing and startup program. The description shall include all contractual or regulatory treatment requirements to be demonstrated.
b. A summary of the objectives and approach for startup checks, functional testing, functional acceptance testing, commissioning, operational acceptance testing, and Performance Testing.
c. List of the instruments, equipment, and systems that will undergo startup and testing with references to the appropriate PIDs, equipment tags/identification numbers, Specification number and standards for testing procedures.
d. Schedule for startup and field testing for each instrument, piece of equipment (including redundant equipment), and system.
e. Safety and emergency response plan including a list of emergency and non-emergency contacts (email and phone).

f. Organization chart for Contractor's startup and testing personnel with assigned responsibilities for each.
g. Startup and testing record keeping plan.
h. Plan for reuse and disposal of water/wastewater from startup, testing, commissioning including information on any required regulatory permits/approvals.
i. Description of temporary facilities that will be provided.
j. List of chemicals to be provided by the Owner.

2. Within 7 to 14 days of initial submittal of the startup plan, the Contractor shall schedule a workshop with the Owner and Engineer to present the plan. The Contactor shall submit minutes of the workshop, including action items and a schedule for updating the startup plan, to the Engineer within 3 days of the workshop.

3. Individual plans for each phase of startup, testing, and commissioning can be assembled as chapters in the startup plan or submitted as individual documents but should be correlated to ensure there is not disagreement between chapters or separate documents.

F. Startup Checks Plan.

1. The startup checks plan shall be subdivided into plans for each system and major component. Each system/major component plan shall include but not be limited to the following:

a. Identification of information for each component or piece of equipment to be inspected as part of the system. All applicable tag numbers shall be included.
b. Specific activities to be completed on each component, piece of equipment, or system as required to demonstrate proper installation and connection.
c. A tracking checklist of prerequisites for the checks and each step of the checking procedure, including any temporary facilities or utility requirements.
d. Listing of manufacturer's representative(s) to be on site during the check.
e. Sign off forms for the Contractor's startup manager.

G. Functional Testing and Functional Acceptance Testing Plans.

1. The functional testing plan shall include procedures and reporting for functional testing. The functional testing plan shall be subdivided into testing plans for each system. Each system test plan shall include but not be limited to the following:

a. A narrative description of the purpose and goals of the test for each component, piece of equipment, or system, which should include all activities (including those required by vendors/suppliers) necessary to verify proper equipment and system functionality.

b. Identification of each component or piece of equipment to be tested as part of the system. All applicable tag numbers shall be included.
c. Schedule and duration for the tests.
d. Prerequisites for each test, including any temporary facilities or utility requirements.
e. Pass/fail criteria for the test.
f. A checklist for tracking testing progress which includes prerequisites for the test and each step of the testing procedure. The check list shall include specified performance criteria that are to be met.
g. A description of test apparatus required to conduct the test.
h. Identification of all temporary facilities and chemicals require during startup.
i. Listing of manufacturer's representative(s) to be on site during the test.
j. Certificates of proper installation, as applicable to the test.
k. Step-by-step detailed procedure of the test. The level of detail shall be sufficient for a witness to be able to follow the steps during the test and be confident that the test is being performed as planned. All steps required to proceed through the test in an orderly manner are considered significant and each of these steps shall be included in the procedure.
l. Copies of the data recording forms that will be used during the test.
m. Calculation methodologies to be used to evaluate the data and/or test criteria for the test.
n. Sample computations or analyses for the test with results in the same format as the final report. This item is intended to demonstrate how data collected will be used to generate final results. A sample shall be included for each type of computation required for the test and analysis of results.
o. Blank sign-off forms for the test acknowledging the startup manager's, Engineer's, Owner's, and equipment manufacturer's acceptance of the test where applicable.

2. The functional testing plan shall identify constraints for individual systems start up, and shall include the following:

a. No water during testing shall be discharged directly into the river.
b. Disinfection shall have been completed as specified prior to any testing.

1.9 REPORTS AND RECORDS.

A. Records of all startup and testing shall be compiled by the Contractor and submitted to the Engineer.

B. Prior to being submitted to the Engineer, the startup manager shall certify that the results recorded and the tested systems comply with the Contract requirements.

C. Records shall include all documentation assembled for each piece of equipment or system involved in the startup and testing, including all certifications, forms, and check lists completed during the startup and test, and sign-off forms.

D. Records of all startup and testing shall be compiled as separate documents for each system tested, and shall be submitted within 48 hours of completion of the startup and testing for each system.

E. Testing samples that require analysis periods greater than 48 hours shall be clearly defined in the startup plan but shall not preclude delivery of the balance of the records within the 48 hour timeframe.

F. The Contractor shall provide formal reporting and documentation of failures, malfunctions or defects, and repairs made during the startup and/or testing activities.

G. A "System Problem Report" form is included at the end of this section, and shall be used by the Contractor to document problems that arise during these tests and their resolution. Records submitted shall include "System Problem Report" forms completed during testing.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

End of Section

SECTION 01739- EQUIPMENT INSTALLATION

PART 1 - GENERAL

1.1 SCOPE.

A. This section covers general installation requirements of new equipment units that have been purchased by Contractor as part of this Work**.** Equipment specific installation requirements are covered in the equipment sections.

1.2 GENERAL.

A. Equipment installed under this section shall be erected and placed in proper operating condition in full conformity with Drawings, Specifications, engineering data, instructions, and recommendations of the equipment manufacturer, unless exceptions are noted by Engineer.

B. Any existing equipment which is removed and salvaged for reinstallation shall be handled as indicated in the Demolition and Salvage section.

C. Coordination.

1. When manufacturer's field services are provided by the equipment manufacturer, Contractor shall coordinate the services with the equipment manufacturer. Contractor shall give Engineer written notice at least 30 days prior to the need for manufacturer's field services furnished by others.

2. Submittals for equipment furnished by others under each procurement contract will be furnished to Contractor upon completion of review by Engineer. Contractor shall review equipment submittals and coordinate with the requirements of the Work and the Contract Documents. Contractor accepts sole responsibility for determining and verifying all quantities, dimensions, and field construction criteria.

3. Flanged connections to equipment including the bolts, nuts, and gaskets are covered in the appropriate pipe specification section.

1.3 DELIVERY, STORAGE, AND HANDLING.

A. Storage.

1. Upon delivery, all equipment and materials shall immediately be stored and protected by Contractor in accordance with the Product Storage and Handling Requirements section until installed in the Work.

2. Equipment shall be protected by Contractor against damage and exposure from the elements. At no time shall the equipment be stored on or come into contact with the ground, grass, or any other type of vegetation.

3. Contractor shall keep the equipment dry at all times.

PART 2 - PRODUCTS

2.1 MATERIALS.

A. Materials shall be as follows:

1. Grout: As specified in the Grouting section.

2. Anti-Seize thread lubricant for SS bolts: As specified in the Anchorage in Concrete and Masonry section.

PART 3 - EXECUTION

3.1 INSTALLATION.

A. Equipment shall not be installed or operated except by, or with the guidance of, qualified personnel having the knowledge and experience necessary to obtain proper results as specified in the Commissioning section.

B. Each equipment unit shall be leveled, aligned, and shimmed into position. Installation procedures shall be as recommended by the equipment manufacturer and as required herein. Shimming between machined surfaces will not be permitted.

C. Anti-seize thread lubricant shall be liberally applied to the threaded portion of all stainless steel bolts during assembly. For equipment installed in drinking water facilities, the anti-seize lubricant shall meet requirements of NSF-61.

D. When specified in the equipment sections, the equipment manufacturer shall provide installation supervision and installation checks. For installation supervision, the manufacturer’s field representative shall observe, instruct, guide, and direct Contractor's erection or installation procedures as specified in the equipment specifications. For installation checks, the manufacturer’s field representative shall inspect the equipment installation immediately following installation by Contractor, and observe the tests indicated in the Commissioning section. The manufacturer's representatives shall revisit the site as often as necessary to ensure installation satisfactory to Owner.

E. All equipment shall be protected after installation, prior to final acceptance by Owner. Protection provisions shall be as recommended by the manufacturer, and shall include provisions to prevent rust, mechanical damage, and foreign objects entering the equipment.

3.2 STARTUP AND TESTING.

A. Startup requirements, and tests associated with startup shall be as indicated in the Commissioning section. Other field tests shall be as indicated in the specific equipment sections. Startup and tests required shall occur in the order listed in the following paragraphs. Tests shall not begin until any installation supervision and installation checks by the equipment manufacturer have been completed, except where noted below.

B. Preliminary Field Tests.

1. Preliminary field tests shall be conducted on all equipment by Contractor as indicated in the Commissioning section. When an installation check is specified in the equipment sections, the equipment manufacturer's representative will participate in these tests to the extent described in the Commissioning section and in the equipment sections.

C. Field System Operation Tests.

1. Field system operation tests shall be conducted on all equipment by Contractor as indicated in the Commissioning section. When an installation check is specified in the equipment sections, the equipment manufacturer's service personnel will participate in these tests to the extent described in the Commissioning section and in the equipment sections.

D. Field Demonstration Tests.

1. Field demonstration tests shall be conducted by the equipment manufacturer on equipment as indicated and as specified in the equipment sections.

E. Field Performance Tests & Distribution Tests.

1. Field performance tests or distribution tests shall be conducted by the equipment manufacturer on equipment as indicated and as specified in the equipment sections.

F. Field Baseline Performance Tests.

1. Field baseline performance tests shall be conducted by Contractor on the equipment indicated in the equipment sections, and the tests shall be performed as indicated. When indicated in the equipment sections, the equipment manufacturer will participate in these tests. This test shall not be considered an acceptance test, but rather a test to determine initial performance curves and efficiency just prior to the equipment entering service.

End of Section

SECTION 02050 - DEMOLITION

PART 1 - GENERAL

1.1 SCOPE

A. This section covers the demolition of existing structures, piping, and sitework and the salvage of existing materials and equipment as indicated on the Drawings.

1.2 GENERAL

A. Contractor shall be responsible for all work under this section. Contractor shall provide 30 days written notice prior to beginning demolition activities.

B. All structures and facilities of the existing wells and intake facilities which are not to be removed must remain in continuous operation during the work.

C. Demolition work shall create minimum interference with Owner's operations and minimum inconvenience to Owner. Contractor shall provide protection and safety of all roadways, sidewalks, and all accessible areas during demolition activities.

D. Blasting will not be permitted.

1.3 SUBMITTALS

A. Demolition Plan.

1. Contractor shall submit a detailed demolition plan indicating the major demolition activities, planned dates, Owner coordination requirements, permit requirements (if any), and any special planning considerations that require coordination with third-parties.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

3.1 SALVAGE

A. Contractor shall salvage the following items from the Existing Vertical Wells 2-5:

1. All existing vertical well motors and associated components, wiring, etc.

3.2 DEMOLITION

A. Removal of equipment or facilities shall include removal of all accessories, piping, wiring, supports, associated electrical starters and devices, baseplates and frames, and all other appurtenances, unless otherwise directed. Existing materials and equipment removed, and not indicated to be reused as a part of the Work, shall become Contractor's property unless otherwise specified, and shall be removed from the Site and properly disposed of or recycled in accordance with state laws.

B. Contractor shall conduct demolition activities in a manner that prevents damage to existing facilities which are indicated to remain and shall provide all necessary protection for existing facilities. Any remaining facilities damaged during demolition shall be repaired by Contractor to a condition equal to or better than the original condition.

C. When demolition is complete, all debris shall be removed from the Site and the Site graded to the lines and grades indicated on the Drawings.

D. Demolished wells shall be plugged and capped in accordance with MDNR requirements and 10 CSR 23.3.110.

E. Structure Demolition

1. The following structures shall be demolished, and the debris shall be removed from the jobsite. Limitations of removal are indicated on the drawings.

    a. Existing Vertical Wells 2 through 5.
    b. Concrete Valve Vaults for existing Vertical Wells 2 through 5.

F. Piping and Equipment Demolition

1. The following piping and equipment shall be removed and shall become the property of Contractor. All such items shall be promptly removed from the jobsite.

    a. All piping and equipment associated with existing Vertical Wells 2 through 5.
    b. Piping, valves, hydrants within the existing Valve Vaults for Vertical Wells 2 through 5 and to any portion of the header being demolished.

G. Sitework Demolition

1. Sitework demolition shall include the following:

    a. Removal of asphaltic concrete pavement and concrete curb within the limits indicated on the Drawings.
    b. Removal of trees and shrubs indicated on the Drawings to be removed and as required to complete the work.
    c. Removal of existing yard piping within the limits indicated on the Drawings.
    d. Removal of existing electrical ducts and cables as indicated on the Drawings.

H. Tree and Plant Protection

1. All trees and other vegetation which must be removed to perform the Work shall be removed and disposed of by Contractor; however, no trees or cultured plants shall be unnecessarily removed unless their removal is indicated on the Drawings. All trees and plants not removed shall be protected against injury from construction operations.

2. All trees within the limits of construction with a diameter of 4-inches and larger shall be maintained and protected by temporary fencing during construction. If trees larger than 4-inches must be removed to perform the Work, the Contractor shall notify Engineer prior to the removal.

3. Contractor shall take extra measures to protect trees designated to be preserved, such as erecting barricades, trimming to prevent damage from construction equipment, and installing pipe and other Work by means of hand excavation or tunneling methods. Such trees shall not be endangered by stockpiling excavated material or storing equipment against their trunks.

4. All trimming, repair, and replacement of trees and plants shall be performed by qualified nurserymen or horticulturists.

5. Tree removal shall be limited to occur only between November and March 31. Removal of trees and shrubs outside of this requires a habitat assessment followed by a presence/absence survey to be submitted to the US Fish and Wildlife Service at the expense of the Contractor.

End of Section

SECTION 05550 - ANCHORAGE IN CONCRETE AND MASONRY

PART 1 - GENERAL

1.1 SCOPE

A. This section covers the design and installation of anchors in concrete and masonry. It includes cast-in-place anchor bolts and anchor rods, adhesive anchors for both threaded rods and reinforcing bars, expansion anchors, and undercut anchors.

1.2 GENERAL

A. Anchors Designed by Engineer

1. Cast-in-place and post-installed anchors that are fully detailed on the Drawings have been designed by Engineer and may not be changed to a different type without written approval of Engineer.

B. Anchors Designed by Contractor's Suppliers

1. Contractor's material suppliers shall be responsible for design of anchors for railings, ladders, equipment, pre-engineered structures, and other manufactured items, as indicated in the Drawings and Specifications.

2. Cast-in-place anchors shall be used unless post-installed types are indicated on the Drawings or accepted by Engineer.

3. Adhesive anchors used in vibrating applications shall only be used if the anchor manufacturer submits documentation indicating that the product is suitable for the anticipated service conditions.

4. Seismic anchorage design for non-structural components shall include the overstrength factors indicated in ASCE 7, Tables 13.5-1 and 13.6-1, when applicable.

5. Design of anchorage into concrete shall be in accordance with ACI 318 Chapter 17, shall consider concrete to be cracked, and shall not include the strengthening effects of supplementary reinforcement or anchor reinforcement unless approved by Engineer.

6. Design of anchorage into masonry shall be in accordance with TMS 402.

7. Shop drawings for anchor bolts, anchor rods, and post-installed anchors shall include full details and shall be sealed by a professional engineer licensed in the state of the project. Calculations shall be furnished when requested by Engineer.

C. Materials

1. Unless otherwise indicated, anchors of structural steel members connected to concrete shall have a diameter of at least 3/4 inch, and structural members connected to masonry shall have a diameter of at least 5/8 inch. Anchors for ladders and equipment shall have a diameter of at least 1/2 inch. Anchors for pedestrian railing systems shall have a diameter of at least 3/8 inch.

2. Unless otherwise indicated on the Drawings, anchors used in the following locations and applications shall be of the indicated materials.

Cast-In-Place Anchor Bolts and Anchor Rods

Submerged locations	Stainless steel.
Locations subject to splashing	Stainless steel.
Buried locations	Stainless steel.
Anchorage of structural steel columns	Galvanized steel.
Other exterior locations	Galvanized steel.
Interior locations not subject to corrosion	Carbon steel.

Adhesive, Expansion, and Undercut Anchors

Submerged locations	Stainless steel.
Locations subject to splashing	Stainless steel.
Buried locations	Stainless steel.
Anchorage of structural steel columns	Stainless steel.
Other exterior locations	Stainless steel.
Interior locations not subject to corrosion	Carbon steel.

D. Adhesive, expansion, and undercut anchors may be used instead of cast-in-place anchors where specifically indicated or permitted on the Drawings or with specific acceptance by Engineer.

1.3 SUBMITTALS

A. Drawings and Data

1. Data, catalog cuts, and manufacturer's research reports (from independent organizations such as ICC-ES or IAPMO UES) indicating the manufacturer and types of adhesive anchors, expansion anchors, and undercut anchors to be supplied shall be submitted in accordance with the Submittal Procedures section.

B. Calculations

1. If Contractor requests use of products other than those indicated herein, calculations may be required as part of the submittal package. Calculations shall be prepared by a

professional engineer licensed in the state of the project, using methods and procedures required by the building code. Contractor shall demonstrate that the proposed substitute anchors are equivalent in all necessary criteria, including strength, spacing and edge distance limitations, embedment depth limitations, temperature limitations, and any other criteria required by Engineer.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Materials shall be handled, transported, and delivered in a manner which will prevent damage or corrosion. Damaged materials shall be promptly replaced. Materials shall be shipped and stored in original manufacturer's packaging.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Unless otherwise indicated on the drawings, materials shall be as indicated below.

Cast-In-Place Anchor Bolts and Anchor Rods	
Carbon steel	ASTM F1554, Grade 36 with compatible nuts.
Galvanized steel	ASTM F1554, Grade 36 with compatible nuts; hot-dip galvanized, ASTM F2329.
Stainless steel	Bolts, ASTM F593, Alloy Group 1 or 2 (minimum yield strength of 45 ksi); nuts, ASTM F594, Alloy Group 1 or 2.
Flat Washers	ANSI B18.22.1; of the same material as anchor bolts and nuts.
Expansion Anchors in Concrete	Products shall be single component anchors tested in accordance with ICC AC193, and shall have a manufacturer's research report in compliance with the applicable building code. The anchors shall be approved for use in cracked concrete, and for resisting seismic forces. Hilti "Kwik-Bolt TZ2" Simpson "Strong-Bolt 2", or DeWalt "Power-Stud+SD2" (carbon steel), "Power-Stud+SD4" (304 stainless steel), and "Power-Stud+SD6" (316 stainless steel).
Expansion Anchors in Grouted Concrete Masonry Units	Products shall be single component anchors tested in accordance with ICC AC01, and shall have a manufacturer's research report in compliance with the applicable building code. Hilti "Kwik-Bolt 1," Simpson "Wedge-All," or DeWalt "Power-Stud+ SD1."
Undercut Anchors in Concrete	Products shall be tested in accordance with ICC AC193, and shall have a manufacturer's research report in compliance with the applicable building code. Hilti "HDA Undercut Anchor" (carbon steel) and "HDA-R Undercut Anchor" (stainless steel), or DeWalt "Atomic+ Undercut Anchor" (A36 carbon steel).

Adhesive Anchors in Concrete	Products shall be tested in accordance with ICC AC308, and shall have a manufacturer's research report in compliance with the applicable building code. The anchors shall be approved for use in cracked concrete, and for resisting seismic forces.
Threaded Rods and Nuts (Carbon Steel)	ASTM A307 or ASTM F1554 Grade 36.
Threaded Rods and Nuts (Stainless Steel)	ASTM F593, CW.
Reinforcing Bars	ASTM A615, Grade 60, deformed.
Reinforcing Bars, weldable	ASTM A706, Grade 60, deformed.
Adhesive	Hilti "HIT-HY 200," or DeWalt "Pure 110+."
Adhesive Anchors in Grouted Concrete Masonry Units	Products shall be tested in accordance with ICC AC58, and shall have a manufacturer's research report in compliance with the applicable building code.
Threaded Rods and Nuts (Carbon Steel)	ASTM A307 or ASTM F1554 Grade 36.
Threaded Rods and Nuts (Stainless Steel)	ASTM F593 CW (Hilti or Powers systems), or ASTM A193 Grades B6, B8, or B8M (for Simpson system).
Adhesive	Hilti "HIT-HY 270," DeWalt "AC100+ Gold," or Simpson "SET XP."
Adhesive Anchors in Hollow Concrete Masonry Units	Products shall be tested in accordance with ICC AC58, and shall have a manufacturer's research report in compliance with the applicable building code.
Threaded Rods and Nuts (Carbon Steel)	ASTM A307 or ASTM F1554 Grade 36.
Threaded Rods and Nuts (Stainless Steel)	ASTM F593 CW (Hilti or Powers systems), or ASTM A193 Grades B6, B8, or B8M (for Simpson system).
Adhesive	Hilti "HIT-HY 270," DeWalt "AC100+ Gold," or Simpson "SET XP."
Screen Tubes	As recommended by the manufacturer.
Adhesive Anchors in Unreinforced Brick Masonry	Products shall be tested in accordance with ICC AC60, and shall have a manufacturer's research report in compliance with the applicable building code.
Threaded Rods and Nuts	ASTM A307.
Adhesive	Hilti "HIT-HY 270," DeWalt "AC100+ Gold", or Simpson "SET."
Screen Tubes	As recommended by the manufacturer.

2.2 ANCHORS

A. Cast-in-Place Anchor Bolts and Anchor Rods

1. Cast-in-place anchor bolts and anchor rods shall have forged heads or embedded nuts and washers. Anchors shall be delivered in time to permit setting prior to the placing of structural concrete or masonry grout. Anchor sleeves shall not be used unless acceptable to Engineer. Unless installed in sleeves, anchor bolts and anchor rods shall be provided with sufficient threads to permit a nut to be installed on the concrete side of the concrete form or the supporting template. Two nuts, a jam nut, and a washer shall be furnished for cast-in-place anchor bolts and anchor rods indicated on the Drawings to have locknuts; two nuts and a washer shall be furnished for cast-in-place anchor bolts and anchor rods without locknuts.

B. Adhesive, Expansion, and Undercut Anchors

1. When adhesive, expansion, or undercut anchors are indicated on the Drawings, only acceptable systems shall be used. Acceptable systems shall include only those systems and products specified or specifically indicated by product name on the Drawings. Alternative anchoring systems may be used only when specifically accepted by Engineer.

2. Unless otherwise noted, single nuts and washers shall be provided with adhesive anchors, expansion anchors, and undercut anchors. Adhesive anchors shall be free of coatings that would weaken the bond with the adhesive.

PART 3 - EXECUTION

3.1 GENERAL

A. Anti-seize thread lubricant shall be liberally applied to projecting, threaded portions of stainless steel anchors immediately before tightening of the nuts.

B. Compliance with Manufacturer’s Instructions

1. Post-installed anchors shall be installed in accordance with the manufacturer’s printed installation instructions and all applicable requirements of the manufacturer’s research report for the specific anchor system. If conflicts are found between the Drawings, the manufacturer’s printed installation instructions, and the manufacturer’s research report installation requirements, Contractor shall notify Engineer for resolution.

C. Special Inspection

1. Special inspection requirements for cast-in-place and post-installed anchors shall be as indicated in the Code-Required Special Inspections and Procedures section. Anchorage work shall be performed in a manner that allows the inspections to take place without adversely impacting the schedule.

3.2 CAST-IN-PLACE ANCHOR BOLTS AND ANCHOR RODS

A. Cast-in-place anchor bolts and anchor rods shall be carefully positioned with templates and secured in the forms prior to placing concrete, or in masonry bond beams prior to placing grout. Contractor shall verify that anchorage devices are positioned in accordance with the Drawings and with applicable equipment or structure submittal drawings.

B. Threads, bolts, and nuts spattered with concrete or masonry grout during placement shall be cleaned prior to final installation of the bolts and nuts.

C. Sleeves shall be filled with non-shrink grout.

3.3 ADHESIVE ANCHORS

A. Adhesive shall be statically mixed in the field during application. All proportioning and mixing of the components shall be in accordance with the manufacturer's recommendations.

B. Anchors or bars shall be installed in holes hammer drilled into hardened concrete or masonry. Drill shall be set to rotation-only mode when drilling into hollow CMU or into brick. Diameter of holes shall be 1/16 inch larger than the outside diameter of the rod or bar unless recommended otherwise by the anchor system manufacturer. Holes shall be prepared by removing all dust and debris using procedures recommended by the adhesive manufacturer.

C. Adhesive anchors and holes shall be clean, dry, and free of grease and other foreign matter at the time of installation. The adhesive shall be placed and the rods or bars shall be set in accordance with the recommendations of the manufacturer. Care shall be taken to ensure that all spaces and cavities are filled with adhesive, without voids.

D. Concrete Installation

1. Unless indicated otherwise on the Drawings, reinforcing bars shall be embedded to a depth of 15 bar diameters, and threaded rods shall be embedded to a depth that will develop the yield strength of the rod.

2. Adhesive anchors in concrete shall be installed under the following conditions.

Minimum Age of Concrete Prior to Anchor Installation	21 days.
Concrete Temperature Range	Maximum short-term temperature 162° F, maximum long-term temperature 110° F.
Moisture Condition	Dry concrete.
Type of Lightweight Concrete	N/A
Hole Drilling and Preparation	Hammer drill only.

3. Installation of adhesive anchors into concrete that are either horizontal or upwardly inclined shall be performed only by personnel certified by the ACI/CRSI Adhesive Anchor Installation Certification Program.

3.4 EXPANSION AND UNDERCUT ANCHORS

A. Expansion and undercut anchors shall be installed using all procedures and accessory devices recommended by the anchor manufacturer.

End of Section

SECTION 13590 – PROCESS CONTROL NETWORK SYSTEMS

PART 1 - GENERAL

1.1 SCOPE

A. The Network Systems section covers the furnishing of all hardware and software for process control network systems for the Instrumentation and Control System. Principal components of the network systems shall be as indicated on the Control Block Diagram and as described below.

B. System Supplier shall furnish all necessary network equipment, interconnecting cables, accessories, software, and appurtenances for proper network operation and to meet the functional requirements indicated on the Drawings and specified herein. Configuration of all hardware shall be provided by the System Supplier.

C. Equipment and services provided under the Network Systems section shall be subject to the general requirements specified in the Instrumentation and Control System section. Supplementing this section, network data, special requirements, and options may be indicated on the Drawings listed above.

D. Control System

1. The Instrumentation and Control System section shall apply to all systems described herein. All applicable requirements specified in the Instrumentation and Control System section shall apply to equipment and services provided herein.

E. Network Functional Description

1. The process control network system shall provide communications between the operator workstations, servers, network switches, fire walls, routers, and PLCs.

1.2 GENERAL

A. System Supplier shall select the process control network equipment for its superior quality and the intended performance. The System Supplier shall install all equipment in accordance with the manufacturer's instructions. Equipment and materials used shall be subject to review and shall comply with the following requirements.

B. General Equipment Stipulations

1. The General Equipment Stipulations shall apply to all equipment and materials provided under this section. If requirements in this specification differ from those in the General Equipment Stipulations, the requirements specified herein shall take precedence.

C. Drawings

1. Supplementing this section, the Drawings indicate locations and arrangement of hardware and enclosures, provide mounting details, and may show other information regarding the connection and interaction with other equipment.

D. Governing Standards

1. Governing Standards for process control network systems shall be as specified in the Instrumentation and Control System section.

E. Power and Instrument Signals

1. Unless otherwise specified, electric power supply to the network equipment will be unregulated 24 volts dc or 120 volts ac. Where shown, network equipment shall be provided with backup power such as an uninterruptible power supply.

F. Appurtenances

1. Special or manufacturer specific power supplies, special cable, special grounding, and isolation devices shall be furnished for proper performance of the equipment.

G. Interchangeability and Appearance

1. To the extent possible, components used for similar types of functions and services shall be the same brand and model line. Similar components of different network hardware shall be the products of the same manufacturer to facilitate maintenance and stocking of spare parts. Whenever possible, identical units shall be furnished.

H. Programming Software

1. Software required for programming, shall be provided for systems that contain any equipment that requires software for routine maintenance and troubleshooting. The programming software shall be the latest version offered by the manufacturer, compatible with the equipment provided, and newly purchased for this project. Programming software shall be turned over to Owner at completion of startup. Programming software shall be licensed to the Owner.

1.3 SUBMITTALS

A. See Section 13500 – Instrumentation and Control System

1. Submittals shall be as specified in the Instrumentation and Control System section.

B. Network Design submittal (to be provided with the First Stage Submittals):

1. A complete process control network topology diagram, detailing all hardware, cabling and the interconnections between all connected equipment. Interconnections to existing installed equipment and Owner-furnished equipment shall be included in the diagram.

2. A complete listing of IP addresses to be assigned to all network and network connected equipment furnished under this contract shall be provided. The assignment of IP addresses shall be coordinated with the Owner. Failure to provide this equipment IP addresses list with the First Stage Submittals could cause the submittal to be returned as unreviewed or rejected outright.

C. O&M Manuals.

1. All above documentation shall also be provided in the O&M manuals. The Ethernet Network Test reports described herein shall be provided with the Third Stage O&M submittals. Failure to provide the Ethernet Network Test reports with the Third Stage O&M submittals could cause the submittal to be returned as unreviewed or rejected outright.

1.4 DELIVERY, SHIPMENT, PROTECTION, AND STORAGE

A. Equipment provided under this section shall be shipped, protected, and stored as specified in the Instrumentation and Control System section. Identification of packaging shall be as described in the Instrumentation and Control System section.

1.5 CONNECTION TO EXISTING OWNER NETWORKS

A. Network hardware and software provided shall be compatible with the Owner's existing process control network systems wherever a system interconnection is provided. System Supplier shall verify existing process control systems to ensure compatibility.

B. All connections to the Owner's existing network shall be fully coordinated between the Owner and the System Supplier. Prior to connecting to the existing network, the System Supplier shall provide a written request to the Owner for an Owner's representative to be available, along with facility approval as described below when existing systems are disconnected and at the time of any new connections.

1.6 COORDINATION WITH OWNER

A. The System Supplier shall coordinate all demolitions, installations and rework on the existing networks with the Owner and the Engineer. No work shall be performed without the written consent of the Owner. The System Supplier shall submit a written request to perform work on the existing network, including date, time, scope of work, length of time, and any Owner's support that may be required.

PART 2 - PRODUCTS

2.1 GENERAL

A. The following paragraphs provide minimum process control Ethernet network device stipulations.

2.2 NETWORK CABLING SPECIFICATIONS

A. Individual network equipment and related devices shall be coordinated with items provided in the following sections:

1. 13591 Metallic and Fiber Optic Communication Cable

2.3 ETHERNET NETWORK HARDWARE

A. Ethernet network hardware shall be provided as specified and/or as shown on the Drawings. All specified functionality of provided Ethernet network equipment shall adhere to the IEEE 802.3 and 802.3u standards using copper wire or fiber optic strands. Ethernet network switches shall support ring, bus, tree, or point-to-point network topologies. On-line signal monitoring shall be provided to detect and locate impending faults. Ethernet network switches shall be replaceable on-line without disrupting the network. Redundant Ethernet switches shall be provided where shown on the Drawings. Ethernet switches shall be provided to connect multiple network segments together, selectively forwarding traffic between the segments.

B. Industrial (Panel-Mounted) Ethernet Switches

1. Managed Ethernet Switches.

a. Each Ethernet switch mounted in a process area enclosure shall include the following functionality:
1) Ports: Switch shall support the quantity of 10/100BaseTX ports and 100BaseFX fiber ports to meet the connectivity and functionality indicated on the Drawings, with a minimum of 20% spare auto-negotiating 10/100Base-T, RJ-45 ports, and **[**two (2)**] [**four (4)**] [**multimode**] [**single mode**] [**LC**] [**SC**]** fiber uplink ports. SFP modules shall be provided as required. A minimum of four UTP ports shall be provided.
2) Each switch connection shall automatically sense the network speed of the devices to which it is connected.
3) Capable of ring-based media redundancy with 30 ms recovery time.
4) Path Redundancy: IEEE 802.1w Rapid Spanning Tree Protocol.
5) Prioritization: IEEE 802.1p QoS Support.
6) Network Segregation: Port VLAN.
7) Management: SNMPv3 and Browser-based management shall be supported.
8) IGMP snooping supported.

9) LED indication of the link activity for each port.
10) Environmental:
    a) Suitable for installation in industrial environments.
    b) Operating Temperature Range: -10 to 60°C. **[**Optional -40 to 60°C**]**
    c) Relative Humidity Range: 10 to 95%
11) Redundant 24 VDC power supply inputs
12) Conformal coating option for use in hazardous environments.
13) Mounting: DIN-rail mounted suitable for panel installation.
14) All necessary memory upgrades, software feature sets, and cables needed for proper operation of these switches shall be furnished with each switch.

b. Power over Ethernet (POE) switches shall have the following functionality:
1) Power Enabling and standards: IEEE 812.3af
2) Power: 48 VDC, 50 watt minimum power supply for power enabling switch.
3) LED indication of the link activity for each port and power forwarding.

c. Switches shall be Cisco Catalyst IE3300 series, Hirschmann BRS-30 series, Moxa EDS-500 series, Red Lion N-Tron 700 series, **[**With POE Injector**]** , or approved equal.

C. Ethernet Connectors

1. Ethernet wiring connectors shall be RJ-45 male modular plug connectors.

2. Standard RJ45 Connectors

a. Standard connectors shall be polycarbonate, clear connectors. Connectors shall conform to RJ-45 and ISO 8877 standards. Contacts shall be gold plated with a 0.5A current rating and a -25º to 60º C temperature rating. Connectors shall accept unshielded Cat-5e or Cat-6, AWG 24, solid conductor cable.

D. Media Converters

1. The System Supplier shall supply fiber optic media converters for all systems requiring conversion from copper media to fiber optic media. All converters shall be mounted in the network panels or process control enclosures. The System Supplier shall coordinate the media converter and termination requirements with the fiber optic cable and network protocols. Media converters shall operate on 120 VAC.

2. Fiber to Copper Converters

Fiber optic to copper media converters for all computer networks shall convert twisted pair 10/100BaseT cable transmissions to 10/100BaseFX fiber optic cable transmissions. Converters shall provide auto-sensing detection of network speed and full duplex or half duplex signaling. Converters shall have diagnostic LEDs for network speed and network traffic. Converter copper port shall be 100BaseTX (RJ-45). Converter fiber port shall be compatible with connectors provided with fiber cable jumpers and compatible with fiber cable type and light wavelength. Transmission Speed shall be 100Mbps on both ports. The converter shall be

powered from 120 volts ac, or shall be provided with a plug-in transformer to provide the required voltage to the device. Converters shall be provided with backup power. Converters shall be DIN rail mounted in network panels or process control enclosures. Converters shall be as manufactured by Lantronix, D-Link, Black Box, Hirschmann,or approved equal.

2.4 SPARE PARTS

A. Spare parts shall be provided as specified below.

Spare parts	Quantity
Switches	1 of each type

PART 3 - EXECUTION

3.1 NETWORK INSTALLATION REQUIREMENTS

A. Additional network installation requirements are specified in the Instrumentation and Control System section. Networks shall be installed and tested in accordance with the following requirements.

3.2 NETWORK CONFIGURATION

A. The System Supplier shall fully configure all network devices. All device selections shall be fully coordinated with the Owner to ensure compatibility with existing systems and standards.

B. Ethernet Switches

1. The System Supplier shall fully configure all Ethernet switches. The following shall be configured:

    a. For managed switches, unused ports shall be disabled for security purposes during the switch configuration via settings or software selection.
    b. Spanning Tree or other appropriate redundancy scheme shall be configured for all redundant links. Trunking or other bandwidth sharing redundancy schemes shall be utilized where available to minimize switching times, and increase available bandwidth.
    c. Management Password Security in accordance with the Owner’s cyber security policy.
    d. Quality of Service, with any traffic to/from PLCs getting priority over all other traffic.
    e. VLAN/subnet network segmentation.

3.3 NETWORK TESTING

A. After each network has been installed, a technical representative of System Supplier shall test the network and shall provide a written report for each test. Specific testing requirements are described in the individual network specification sections.

B. Systems Check

1. A technical representative of System Supplier shall participate in the checkout of network systems. Systems check requirements shall be as specified in the Instrumentation and Control System section.

C. Test Equipment

1. Unless specified otherwise, all test equipment for the calibration and checking of system components shall be provided by System Supplier for the duration of the testing work and this test equipment will remain the property of System Supplier.

2. Ethernet Network Minimum Test Requirements

a. The following minimum tests are to be performed by the System Supplier:
   1) Verify Link Integrity Status LED is lit on both sides of each link. Refer to product manuals to confirm the LED status indication for each network interface card or network device.
   2) Verify proper operation and failover of each redundant component and redundant link. Each redundant server, PLC, or other network hardware device shall be powered down or disconnected from the network to verify that the other device successfully takes control, and all functionality exists. For redundant network connections, each network connection shall be disconnected to verify that there is no loss of communication on the network.
   3) Verify alarming of each link failure. Network failure alarms shall be configured within the network interface card software or other network device configuration software. For PLC communication, communication heartbeats shall be configured to detect a loss of communication, and alarms shall be configured when the heartbeat is not received. The generation of a communication alarm shall be confirmed for each network device.
   4) Verify bandwidth usage of fully installed systems as part of the Operation Acceptance Testing as specified in the Commissioning section. The analysis of the network utilization and bandwidth usage shall be performed using SolarWinds NetFlow Traffic Analyzer or equivalent. Any concerns identified from the analysis shall be clearly identified with the recommended corrective actions.

3. Ethernet Network Test Reports

a. Upon completion and testing of the installed Ethernet network, the System Supplier shall submit test reports to the Engineer in printed form. Test reports are

to show all test results performed by the System Supplier for each port and piece of equipment. Date of calibration of the test equipment is also to be provided.

3.4 NETWORK TROUBLESHOOTING

A. It is the System Supplier's responsibility to provide trouble-free and reliable networks. The System Supplier shall employ any means necessary to ensure operational networks. The System Supplier shall obtain any needed test equipment, including but not limited to time-domain reflectometers, protocol analyzers and network sniffers, to troubleshoot any problems. The System Supplier shall utilize the services of a trained and certified Network Engineer that is regularly involved in troubleshooting network problems, in the event that operational or reliability problems exist. Acceptable certifications include Cisco CCNP, Cisco CCIE, or Network Professional Association Certified Network Professional (CNP).

End of Section

SECTION 13591 - METALLIC AND FIBER OPTIC COMMUNICATION CABLE AND CONNECTORS

PART 1 - GENERAL

1.1 SCOPE

A. The Metallic and Fiber Optic Communications Cable and Connectors section covers the furnishing and installation of cable systems to provide communications for the Instrumentation and Control System as indicated on the Drawings.

B. Accessories and appurtenances shall be provided as specified herein to provide a complete and properly operating system.

C. Equipment and services provided under this section shall be subject to the General Computer Control System Requirements specified in the Instrumentation and Control System Section and the Network Systems section. Supplementing the Metallic and Fiber Optic Communications Cable and Connectors section, network data, special requirements, and options are indicated on the Drawings.

1.2 SUBMITTALS

A. See Section Instrumentation and Control System section.

1. Submittals shall be as specified in the Instrumentation and Control System section.

B. Qualifications

1. The name, address and telephone number of the proposed contractor or subcontractor, including specific personnel to perform the work shall be included with the submittals. Provide the experience record of the subcontractor and personnel in performing work similar to that specified. Include the agency, contact person, and telephone number of at least three (3) previous network installation projects completed by the proposed subcontractor. The Engineer shall review and approve the network installation subcontractor and personnel prior to any of the related work being performed. This review will be conducted during the project submittal phase, as described below.

C. Drawings and Data

1. All material and equipment documentation shall be submitted for review in accordance with the Submittals section. Each sheet of descriptive literature submitted shall be clearly marked to identify the material or equipment.

2. Product data shall include the following in the Submittals section:

a. Cut sheets and catalog literature for proposed fiber optic cable, and fiber optic cable accessories (pigtails, connectors, etc.)
b. Manufacturer specifications and data that clearly shows that the fiber optic cable meets all requirement specified herein.
c. Sample of the proposed cable.
d. Physical dimension drawings of all fiber optic accessories.
e. Proposed fiber identification sequence and labeling.
f. Provide off-line maintenance aids and on-line diagnostics to check the performance of the communication links and interfaces of devices on the data highway.
g. Provide a Recommended Spare Parts List (RSPL).
h. Provide a list of recommended special tools for fiber installation testing or maintenance.

D. Operations and Maintenance Manuals

1. Operation and Maintenance Manuals shall have the following items included in addition to those items specified in other sections:

a. Description of all components.
b. Methods of connection.
c. Connection diagram.
d. OTDR trace plots for all fibers.

1.3 SHIPMENT, PROTECTION, AND STORAGE

A. Equipment provided under this section shall be shipped, protected, and stored in accordance with the requirements of the Instrumentation and Control System section.

1.4 QUALIFICATIONS

A. Due to the specialized nature of installing, splicing, terminating, and testing optical fiber cable, the Contractor shall utilize personnel who are experienced in such practices. The installing Contractor or Subcontractor shall have performed similar installation and testing work on at least three projects of similar size and complexity. The personnel assigned to the installation and testing shall also have experience on at least three projects of similar size and complexity.

PART 2 - PRODUCTS

2.1 GENERAL

A. All fiber optic cable, fiber optic hardware and accessories shall be designed, assembled and connected in accordance with the requirements of these Specifications and the Drawings.

2.2 ETHERNET UNSHIELDED TWISTED PAIR (UTP) CABLE

A. Ethernet cables and connectors shall be provided for a complete and working system, and/or as shown on the Drawings. Cable for Ethernet wiring shall be UTP Cat-5e or Cat-6 cable. Cable shall be Cat-5e for network speeds up to 100 MHz, and Cat-6 for network speeds greater than 100 MHz. Jacket color coding for cables shall be as follows:

1. Standard Cat-6 - Yellow

2. Crossover cables - Red

B. Category 6 UTP Cable

1. Cat-6 cable shall meet the following requirements:

a. 24 AWG
b. 4 pair solid strand FEP Teflon insulation
c. 100 Ohm impedance
d. 1-250 MHz frequency range
e. Min attenuation 19.9 Db
f. 100 Ohm impedance
g. Min NEXT 44.3dB/100MHz
h. Min PS-NEXT 42.3dB/100MHz
i. Min ELFEXT 27.8dB/100MHz
j. Min PS-ELFEXT 24.8dB/100MHz
k. Min return loss 20.1 dB/100 MHz
l. Max delay skew 45 ns
m. Max propagation delay 540 ns

2. Plenum rated cable shall have FEP insulation jacketing and FEP insulation for conductors. Non plenum rated cable shall have PVC insulation jacketing and polyethylene insulation for conductors. Cat-6 cable shall be Belden 1872 or equal.

C. Ethernet Patch Cables

1. Pre-wired and terminated patch cables with RJ-45 connectors and lever protecting boot shall be furnished for all connections to computers, network equipment, and controller equipment except where physical conditions (i.e. length over 12 ft. or conduit size) require unterminated wire to be installed. Patch cables shall be Cat-5e for networks speeds up to 100 MHz, and Cat-6 for networks speeds greater than 100 MHz and shall meet the requirements of Cat-5e and Cat-6 cable specified in this section. Straight through cables shall be wired using the T568-B standard for both connectors as shown in section 3 (Ethernet Cable Installation). Crossover cables shall be wired using the T568-A standard for one connector and the T568-B standard for the opposite end.

2.3 FIBER OPTIC CABLE

A. The fiber optic cable must meet all of the requirements of the following paragraphs.

1. The fiber optic cable must meet the following requirements of the National Electrical Code (NEC) Section 770.

2. Riser Applications – Applicable Flame Test UL 1666.

3. Finished cables shall conform to the applicable performance requirements of Table 8-6 and 8-7 in the Insulated Cable Engineers Association, Inc. (ICEA) Standard for Fiber Optic Premises Distribution Cable (ICEA S-83-596).

4. Every fiber in the cable must be usable and meet required specifications.

5. All optical fibers shall be sufficiently free of surface imperfections and inclusions to meet the optical, mechanical, and environmental requirements of this specification.

6. Each optical fiber shall consist of a doped silica core surrounded by a concentric glass cladding. The fiber shall be a matched clad design.

7. All optical fibers shall be proof tested by the fiber manufacturer at a minimum load of 100 kpsi.

8. All optical fibers shall be 100 percent attenuation tested. The attenuation shall be measured at 850 nm, and 1300 nm for multimode fibers. The attenuation shall be measured at 1310 nm and 1550 nm for single-mode fibers. The manufacturer shall store these values for a minimum of 5 years. These values shall be available upon request.

9. The storage temperature range for the cable on the original shipping reel shall be –40ºC to +70ºC. The operating temperature range shall be –40ºC to +70ºC. Testing shall be in accordance with FOTP-3.

10. The attenuation specification shall be a maximum attenuation for each fiber at 23 $\pm$ 5^{O}C.

11. The attenuation of the cabled fiber shall be uniformly distributed throughout its length such that there are no discontinuities greater than 0.2 dB at 850 nm/1300 nm (multimode) in any one kilometer length of fiber.

12. Required Fiber Grade: Maximum Fiber Attenuation at 850 nm shall be 3.5 dB/km.

13. Optical fibers shall be placed inside a loose buffer tube. The nominal outer diameter of the buffer tube shall be 3.0 mm.

14. The cable shall contain 24 fibers. Each buffer tube shall contain up to 12 fibers.

15. The fibers shall not adhere to the inside of the buffer tube.

16. Each fiber shall be distinguishable from others by means of color coding in accordance with TIA/EIA-598-A, “Optical Fiber Cable Color Coding.”

17. The fibers shall be colored with ultraviolet (UV) curable inks.

18. Buffer tubes containing fibers shall also be color coded with distinct and recognizable colors in accordance with TIA/EIA-598-A, "Optical Fiber Cable Color Coding."

19. In buffer tubes containing multiple fibers, the colors shall be stable during temperature cycling and not subject to fading or smearing onto each other. Colors shall not cause fibers to stick together.

20. The buffer tubes shall be resistant to kinking.

21. The cable jacket color shall be black.

22. Fibers may be included in the cable core to lend symmetry to the cable cross-section where needed. Fibers shall be placed so that they do not interrupt the consecutive positions of the buffer tubes. In dual layer cables, any fillers shall be placed in the inner layer. Fillers shall be nominally 3.0 nm in outer diameter.

23. The jacket shall be continuous, free from pinholes, splits, blisters, or other imperfections. The jacket shall have a consistent, uniform thickness; jackets extruded under high pressure are not acceptable. The jacket shall be smooth, as consistent with the best commercial practice. The jacket shall provide the cable with a tough, flexible, protective coating, able to withstand the stresses expected in normal installation and service.

24. The outer cable jacket shall be marked with the manufacturer's name or UL file number, date of manufacture, fiber type, flame rating, UL symbol, and sequential length markings every two feet (e.g. "62.5/125 MICRON – TYPE OFNR – (UL) 00001 Feet"). The print color shall be white.

25. The cable shall be all-dielectric.

26. The cable shall be gel-free.

27. Flammability – All cables shall comply with the requirements of the 1996 NEC Article 770. All cables shall pass UL 1666.

B. Fiber optic cable shall be as manufactured by Corning Cable Systems, Belden, Commscope, TE Connectivity, or equal.

C. Singlemode Fiber

1. Singlemode fiber optic cable shall meet the following requirements:

    a. The dispersion unshifted single-mode fiber utilized in the cable specified herein shall conform to the specifications herein.
    b. Cladding Diameter: 125.0 + 1.0 μm.
    c. Core-to-Cladding Offset: < 0.8 μm.
    d. Cladding Non-Circuladty: < 1.0%.
    e. Coating Diameter: 245 ± 10 μm.
    f. Colored Fiber Diameter: nominal 900 μm.

g. Attenuation Uniformity: No point discontinuity greater than 0. 1 0 dB at either 1310 nm or 1550 nm.
h. Attenuation at the Water Peak: The attenuation at 1383 ± 3 nm shall not exceed 2.1 dB/km.
i. Cutoff Wavelength: The cabled fiber cutoff wavelength(λccf,) shall be < 1260 nm.
j. Mode-Field Diameter: 9.30±0.50 μm at 1310 nm 10.50 ± 1.00 micrometers at 1550 nm.
k. Zero Dispersion Wavelength (λo): 1301.5 nm < λo < 1321.5 nm.
l. Zero Dispersion Slope (So): < 0.092 ps/(nm^2 *km).
m. Fiber Polarization Mode Dispersion (PMD): < 0.5 ps/(sq. km)

D. Fiber optic cable connectors

1. All optical fibers shall be terminated with connectors that are LC for singlemode cable.

2. Epoxy Connectors

a. Epoxy connectors shall be provided to terminate each fiber in the cable. Connector style shall be coordinated with the patch panels and field devices that will interface directly with the cable. Connectors shall be compatible with the supplied cable. Connector loss shall be no greater than 0.3 dB. Loss measurement shall be performed at the time of splicing and documentation shall be furnished for each termination. Connectors shall be Corning Cable Systems Connectors, or equal.

3. Fiber Optic Jumper Cables

a. Fiber optic jumper cables shall be furnished and installed for equipment interfacing and between termination cabinets. The jumpers shall meet the following requirements:
1) The jumpers shall be tight-buffered and be protected by Kevlar-type strength material.
2) The jumpers shall be supplied with connectors on each end. Connector types (ST, SC, LC, etc.) shall be matched to the equipment provided. Jumpers shall be sized to provide a single connection between the fiber optic hardware being connected.

PART 3 - EXECUTION

3.1 INSTALLATION

A. The System Supplier shall be responsible for the coordination of the installation of all cable furnished hereunder. The System Supplier shall be responsible for the termination of all cable furnished hereunder.

B. Cable Damage

1. If the cable becomes damaged during installation, the Contractor shall stop work and notify the Engineer immediately. The Owner and Engineer will decide whether to replace the entire reel of cable or to install a splice at the damaged section. If the Owner decides to replace the entire reel of cable, the Contractor shall begin the installation at the last designated splice point. The damaged cable between these points shall be removed, coiled, tagged, and given to the Owner. Installation of new cable to replace damaged cable shall not be a basis of extra payment or contract completion time. In addition to installation of the new cable, the Contractor shall reimburse the Owner for the entire cost of the replacement reel of cable. This cost will be withheld from the contract price. If the Owner decides to install a splice at the damaged point, and the cable is damaged a second time, the entire reel of damaged cable (and all subsequent damaged reels) shall be replaced with new reels at the Contractor's expense.

C. Ethernet Cable Installation

1. Straight through cables shall be wired using the latest version of T568 standard for both connectors as shown in the table below (connector pin numbers are left to right with the clip down). Crossover cables shall be wired using the T568A standard for one connector and the T568B standard for the opposite end as shown in the table below.

Connector Pin	568A Wiring Conductor	568B Wiring Conductor
1	White/Green	White/Orange
2	Green	Orange
3	White/Orange	White/Green
6	Orange	Green
4	Blue	Blue
5	White/Blue	White/Blue
7	White/Brown	White/Brown
8	Brown	Brown

2. Shielded Cat-6 cabling shall be grounded on only one end of the cable.

D. Fiber Optic Cable Installation

1. The cable manufacturer shall provide installation procedures and technical support concerning the items contained in this specification. Fiber optic cable installation shall meet the following requirements:

a. All fiber optic cable shall be installed, terminated, and tested by the System Supplier or his fiber subcontractor as specified above.

b. In pulling the cable, strain-release, or other tension limiting devices shall be used to limit the pull tension to less than 600 lbs.
c. Minimum bend radius restrictions shall be satisfied both during and after cable installation.
d. Horizontal, unsupported cable runs shall be supported at continuous distances of 5 feet or less.
e. All conduit and cabinet entrances shall be sealed with RTV or other re-enterable sealant material to prevent ingress of water, dust or other foreign materials.
f. Cable routing within occupied office areas shall conform to Federal, State, and local electrical and fire codes.
g. Any non-terminating (field) splices shall be documented as to the physical location and cable meter mark (prior to stripping). Field splices shall be OTDR-tested and documented prior to final cable acceptance testing.
h. Fiber optic cables shall be installed in accordance with the latest version of NECA 301, Installing And Testing Fiber Optic Cables.

3.2 CABLE TESTING

A. After the network cabling has been installed, each network cable shall be tested.

B. Test Equipment

1. Unless specified otherwise, all test equipment for the calibration and checking of system components shall be provided by System Supplier for the duration of the testing work and this test equipment will remain the property of System Supplier.

C. Ethernet UTP Cable Testing

1. The System Supplier shall utilize the previously specified test equipment, and additional tools as needed to validate the Ethernet UTP cable installation. All test equipment shall bear current calibration certification from a certified calibration laboratory, as appropriate. Each cable shall be tested for open pairs, shorted pairs, crossed pairs, reversed pairs and split pairs. A check off sheet shall be utilized, shall be signed by the technician testing the cables, and shall be submitted for approval. Any identified faults shall be corrected at no additional cost.

D. Fiber Optic Cable Testing

1. Acceptance testing of the data highway (fiber and electronic equipment) shall be conducted as a part of integrated system field testing, as specified elsewhere. Prior to such tests, however, the fiber optic cable shall be tested as specified herein.

2. The System Supplier, or his fiber subcontractor, shall conduct fiber optic cable testing as specified below. All testing following field installation shall be witnessed by the Engineer. The Contractor shall bear the cost for field witnessed testing in accordance with the General Equipment Stipulations section. A test plan shall be submitted prior to the proposed test dates. The test plan and procedures shall be mutually agreed to prior to conducting the tests.

3. Each optical fiber of each fiber optic cable shall be OTDR (Optical Time Domain Reflectometer) tested on the reel at the factory, on the reel upon arrival at the jobsite, and after installation and termination. For each fiber, an OTDR (Optical Time Domain Reflectometer) trace soft/hardcopy is required to be provided to the Owner and Engineer. OTDR traces shall be provided for each test (at the factory, on the reel at the job-site, and after installation). A 100 foot launch cable shall be spliced to each fiber for each fiber OTDR test, to ensure accurate results. This end-to-end trace shall be performed from BOTH ends of the fiber. Also for each fiber, an end-to-end power attenuation (insertion loss) test shall be performed. The attenuation test shall use a stabilized optical source and an optical power meter calibrated to the appropriate operating wavelength (1300 nm).

4. For each installed fiber, the power attenuation shall not exceed the following, tested from connector to connector at the respective patch panels:

    a. $(0.0035)L + (0.25)N + 3.0$ dB
        1) Where L = The length of the fiber optic cable in meters and
        2) N = the number of splices in the fiber.

5. Any fiber optic cables containing one or more fibers not meeting this performance will not be accepted by the Owner and shall be repaired or replaced at no additional cost.

6. Each fiber optic jumper cable shall be tested and must exhibit an end-to-end attenuation of less than 2.0 dB at 1300 nm. Any jumper exceeding this level shall be replaced at no additional cost to the owner. Any damaged cable still on the reel shall be returned to the manufacturer for replacement at no additional cost to the Owner.

7. All fiber cable testing shall be documented on pre-approved test forms. Three (3) copies of all documentation (including OTDR traces) shall be submitted to the Engineer upon successful completion of the testing.

End of Section

Supplement B - Assurance Deposit Estimation Worksheet

Date: _____

Plan Review No.: _____

Plan Review Title: _____

From Levee Station: _____

To Levee Station: _____

Owner: _____

Company: _____

Address: _____

BURNS McDONNELL

North Kansas City Levee District

INCORPORATED
—1909—
CLAY COUNTY, MISSOURI

TWO SOUTH MAIN, LIBERTY, MO 64068
(816) 781-4788

The North Kansas City levee was constructed with a clay layer to prevent groundwater from discharging at the surface. If a proposed project within the NKCLD critical zone or District right-of-way penetrates the clay layer, the layer must be restored to pre-construction conditions or better. The plans and specifications approved during the plan review process meet the minimum requirements for restoration. The District must be assured that the construction follows the approved plans. The responsibility for this assurance is placed on the Engineer of Record for the project:

Option #1 - Surety Bond or Deposit (Square Footage)
Before an excavation permit is issued, the Engineer of Record shall make a deposit in the following amount, payable to the District, unless a lesser amount is approved by the Board of Supervisors. After bond is made, no applicant or grantee shall be required to make additional deposits for any permit; provided, that the deposit must be kept intact at all times; and provided further, that if the District is required to use any part of the bond for any purpose, no applicant shall be entitled to further permits until the deposit is restored to original value. The total deposit shall be refunded when the Engineer of Record provides certified construction records, copies of compliance documents, and other assurances that the work was constructed following the approved plans and specifications, and the District or its representatives, in their sole discretion, deem the project satisfactorily complete.

- If project features are less than or equal to One Hundred Square Feet (100 sq.ft.), a deposit in the amount of Five Thousand Dollars ($5,000) is required.

- If project features are greater than One Hundred Square Feet (100 sq.ft.), a deposit in the amount of Fifty Dollars per square foot ($50/sq.ft.) is required.

otal Project Area (sq.ft.	
Total Required Deposit	

Option #2 - Performance/Maintenance Bond or Deposit (Project Value)
Before an excavation permit is issued, the Engineer of Record shall deposit a Performance and Maintenance Bond in the following amount, payable to the District, unless a lesser amount is approved by the Board of Supervisors. After bond is made, no applicant or grantee shall be required to make additional deposits for any permit; provided, that the deposit must be kept intact at all times; and provided further, that if the District is required to use any part of the bond for any purpose, no applicant shall be entitled to further permits until the deposit is restored to original value. The total deposit shall be refunded when the Engineer of Record provides certified construction records, copies of compliance documents, and other assurances that the work was constructed following the approved plans and specifications, and the District or its representatives, in their sole discretion,

- If project features are less than or equal to Five Thousand Dollars ($5,000) in material value*, a deposit in the amount of Five Thousand Dollars ($5,000) is required.

- If project features exceed Five Thousand Dollars ($5,000) in material value*, a deposit in the amount of a base bond of Five Thousand Dollars plus an additional Fifty Cents per Dollar ($5,000 + 0.50¢/dollar) is required.

*Project value determined on the basis of raw material cost and should not include equipment, equipment rentals, mobilization, labor, and other associated costs.

Total Material Cost ($)	
Total Required Deposit	

Option #3 - Straight Deposit
Before an excavation permit is issued, the Engineer of Record shall make a deposit in the amount of Ten Thousand Dollars ($10,000), payable to the District, unless a lesser deposit is approved by the Board of Supervisors times. The total deposit shall be refunded when the Engineer of Record provides certified construction records, copies of compliance documents, and other assurances that the work was constructed following the approved plans and specifications.

Total Required Deposit	

Special Provisions:
Evaluated on a case-by-case basis, projects requiring special provisions will be assigned additional deposit requirements based on the size and complexity of the project. Special provisions could include, but are not limited to:

- Project requires a United States Army Corps of Engineers (USACE) Section 408 permit
- Project proposes trenchless installation and/or underground borings across multiple utilities or railroads
- Project proposes significant grade changes and/or alterations to existing stormwater infrastructure that could have the potential to directly impact the levee and its appurtenances

Total Deposit from Special Provisions	

The monetary assurance required for the completion of project construction and other associated activities is: $ _____

CITY OF FOUNTAINS
HEART OF THE NATION
KANSAS CITY
MISSOURI

ADDENDUM NUMBER 2

Project Number 80002543/9911

Project Title Vertical Wells 2 – 5 Replacement

ISSUE DATE: **Jan 21, 2026**

Bidders are hereby notified that the Bidding and Contract Documents for the above project, for which Bids are to be received on 2/3/2026, are amended as follows:

Q6.	Who is the manufacturer of the existing medium voltage gear?
A6.	**The existing medium voltage gear is Ampgard MV Motor Control equipment manufactured by Eaton.**
Q7.	Which specific County's rate should be utilized?
A7.	**Clay County's Rate should be utilized.**
Q8.	Will this be considered a Building or Heavy project?
A8.	**This will be a Heavy Project.**

Specifications

1. Section 16050
   a. Delete Paragraph 3.2. B. and Replace in its entirety with the following: "The scope of the analysis shall include all new or modified electrical equipment and any equipment who's incident energy is impacted as a result of the design. Contractor shall develop SKM model for studies from one-lines in this plan set, existing one-lines in pdf format from past projects available from owner and field conditions found during construction."

Drawings:

1. Drawing VW-E-002
   a. ADD the following Note 4 under "Electrical Power Studies"
   "4. CONTRACTOR SHALL DEVELOP SKM MODEL FOR STUDIES FROM ONE-LINES IN THIS PLAN SET, EXISTING ONE-LINES IN PDF FORMAT FROM PAST PROJECT AVAILABLE FROM OWNER AND FIELD CONDITIONS FOUND DURING CONSTRUCTION."

NOTE: Bidders must acknowledge receipt of this Addendum by listing the number and date, where provided, on the Bid Form - Document 00410.

CITY OF FOUNTAINS
HEART OF THE NATION
KANSAS CITY
MISSOURI

ADDENDUM NUMBER 3

Project Number 80002543/9911

Project Title Vertical Wells 2 – 5 Replacement

ISSUE DATE: **Feb 2, 2026**

Bidders are hereby notified that the Bidding and Contract Documents for the above project, for which Bids are to be received on 2/10/2026, are amended as follows:

The Bid date for this Project stated in Document 00130 - Invitation to Bid shall be changed to: 2:00 PM, on **2/10/2026.**

Specifications

1. Under Section 00830 – Wage Rate Requirements, Delete Annual Wage Order No. 32 CASS COUNTY. Delete Annual Wage Order No. 32 JACKSON COUNTY. Delete Annual Wage Order No. 32 PLATTE COUNTY. Delete Annual Wage Order No. 32 RAY COUNTY

NOTE: Bidders must acknowledge receipt of this Addendum by listing the number and date, where provided, on the Bid Form - Document 00410.

CITY OF FOUNTAINS
HEART OF THE NATION

KANSAS CITY
MISSOURI

INVITATION TO BID

Project/Contract Number 80002543/9911

Project Title Vertical Wells 2-5 Replacement

The General Services Department of Kansas City, Missouri will receive sealed Bids until **2:00 PM, on February 10, 2026 4800 E. 63rd Street, Kansas City, MO. 64130 at the Water Services Department for project Vertical Wells 2-5 Replacement – project No. 80002543**. Bids will be opened after that time.

City desires that Minority Business Enterprises (MBE) and Women's Business Enterprises (WBE) have a maximum opportunity to participate in the performance of City contracts. The goals for this specific Project are (**11**%) MBE participation and (**11%**) WBE participation.

Bidding Documents will be available online to all interested parties at the Kansas City, Missouri Plan Room, http://www.kcmoplanroom.org. All addenda will be posted at this location. Any document or plan may be viewed or downloaded from this location.

Bidders are requested to attend the Mandatory In-Person, Pre-Bid Conference at **10 a.m., on Monday, January 12, 2026.** Water services Department. 4800E. 63rd. St. Kansas City MO 64130

Project Manager: Hamza Damer
Phone Number:816-513-0219
E-mail: hamza.damer@kcmo.org

Contract Administrator: Marzella Newman-Buckner
Phone Number: 816-513-0319
E-mail: marzella.newman-buckner@kcmo.org

View all procurement and contracting opportunities at http://www.kcmo.org

SECTION 00830

PREVAILING WAGE

1. Annual Wage Order No. 32
2. **0830.03 Division of Labor Standards Rules & Regulations** are incorporated into and made part of this Contract and are available at http://s1.sos.mo.gov/cmsimages/adrules/csr/current/8csr/8c30-3.pdf.

Missouri
Division of Labor Standards
WAGE AND HOUR SECTION

MIKE KEHOE, Governor

Annual Wage Order No. 32

Section 083
PLATTE COUNTY

In accordance with Section 290.262 RSMo 2000, within thirty (30) days after a certified copy of this Annual Wage Order has been filed with the Secretary of State as indicated below, any person who may be affected by this Annual Wage Order may object by filing an objection in triplicate with the Labor and Industrial Relations Commission, P.O. Box 599, Jefferson City, MO 65102-0599. Such objections must set forth in writing the specific grounds of objection. Each objection shall certify that a copy has been furnished to the Division of Labor Standards, P.O. Box 449, Jefferson City, MO 65102-0449 pursuant to 8 CSR 20-5.010(1). A certified copy of the Annual Wage Order has been filed with the Secretary of State of Missouri.

Original Signed by
Logan Hobbs, Director
Division of Labor Standards

Filed With Secretary of State: **March 10, 2025**

Last Date Objections May Be Filed: **April 9, 2025**

Prepared by Missouri Department of Labor and Industrial Relations

Building Construction Rates for
PLATTE County

Section 083

OCCUPATIONAL TITLE	**Prevailing Hourly Rate
Asbestos Worker	$71.19
Boilermaker	$34.28*
Bricklayer-Stone Mason	$64.62
Carpenter	$66.80
Lather	
Linoleum Layer	
Millwright	
Pile Driver	
Cement Mason	$57.71
Plasterer	
Communication Technician	$65.55
Electrician (Inside Wireman)	$75.86
Electrician Outside Lineman	$34.28*
Lineman Operator	
Lineman - Tree Trimmer	
Groundman	
Groundman - Tree Trimmer	
Elevator Constructor	$34.28*
Glazier	$34.28*
Ironworker	$71.57
Laborer	$50.93
General Laborer	
First Semi-Skilled	
Second Semi-Skilled	
Mason	$54.93
Marble Mason	
Marble Finisher	
Terrazzo Worker	
Terrazzo Finisher	
Tile Setter	
Tile Finisher	
Operating Engineer	$65.88
Group I	
Group II	
Group III	
Group III-A	
Group IV	
Group V	
Painter	$55.19
Plumber	$82.42
Pipe Fitter	
Roofer	$61.62
Sheet Metal Worker	$79.11
Sprinkler Fitter	$70.76
Truck Driver	$34.28*
Truck Control Service Driver	
Group I	
Group II	
Group III	
Group IV	

*The Division of Labor Standards received fewer than 1,000 reportable hours for this occupational title. The public works contracting minimum wage is established for this occupational title using data provided by Missouri Economic Research and Information Center.
**The Prevailing Hourly Rate includes any applicable fringe benefit amounts for each occupational title as defined in RSMo Section 290.210.

Heavy Construction Rates for
PLATTE County

Section 083

OCCUPATIONAL TITLE	**Prevailing Hourly Rate
Carpenter	$67.97
Millwright	
Pile Driver	
Electrician (Outside Lineman)	$34.28*
Lineman Operator	
Lineman - Tree Trimmer	
Groundman	
Groundman - Tree Trimmer	
Laborer	$52.48
General Laborer	
Skilled Laborer	
Operating Engineer	$61.20
Group I	
Group II	
Group III	
Group IV	
Truck Driver	$53.30
Truck Control Service Driver	
Group I	
Group II	
Group III	
Group IV	

Use Heavy Construction Rates on Highway and Heavy construction in accordance with the classifications of construction work established in 8 CSR 30-3.040(3).

Use Building Construction Rates on Building construction in accordance with the classifications of construction work established in 8 CSR 30-3.040(2).

If a worker is performing work on a heavy construction project within an occupational title that is not listed on the Heavy Construction Rate Sheet, use the rate for that occupational title as shown on the Building Construction Rate Sheet.

*The Division of Labor Standards received fewer than 1,000 reportable hours for this occupational title. Public works contracting minimum wage is established for this occupational title using data provided by Missouri Economic Research and Information Center.

**The Prevailing Hourly Rate includes any applicable fringe benefit amounts for each occupational title.

OVERTIME
and
HOLIDAYS

OVERTIME

For all work performed on a Sunday or a holiday, not less than twice (2x) the prevailing hourly rate of wages for work of a similar character in the locality in which the work is performed or the public works contracting minimum wage, whichever is applicable, shall be paid to all workers employed by or on behalf of any public body engaged in the construction of public works, exclusive of maintenance work.

For all overtime work performed, not less than one and one-half (1½) the prevailing hourly rate of wages for work of a similar character in the locality in which the work is performed or the public works contracting minimum wage, whichever is applicable, shall be paid to all workers employed by or on behalf of any public body engaged in the construction of public works, exclusive of maintenance work or contractual obligation. For purposes of this subdivision, **"overtime work"** shall include work that exceeds ten hours in one day and work in excess of forty hours in one calendar week; and

A thirty-minute lunch period on each calendar day shall be allowed for each worker on a public works project, provided that such time shall not be considered as time worked.

HOLIDAYS

January first;
The last Monday in May;
July fourth;
The first Monday in September;
November eleventh;
The fourth Thursday in November; and
December twenty-fifth;

If any holiday falls on a Sunday, the following Monday shall be considered a holiday.

CITY OF FOUNTAINS
HEART OF THE NATION
KANSAS CITY
MISSOURI

ADDENDUM NUMBER 4

Project Number 80002543/9911

Project Title Vertical Wells 2 – 5 Replacement

ISSUE DATE: **Feb 3, 2026**

Bidders are hereby notified that the Bidding and Contract Documents for the above project, for which Bids are to be received on 2/10/2026, are amended as follows:

Specifications

Section 02670

1. Paragraph 1.3.B. REPLACE the current paragraph with the following:
   "The Contractor shall demonstrate successful experience drilling large diameter boreholes between 44 and 48 inches in unconsolidated alluvial formations. Documentation shall confirm that boreholes remained open and stable throughout drilling, allowing for the uninterrupted installation of large diameter casing and screen strings without borehole collapse, degradation, or restriction. Additionally, the Contractor shall provide examples of completed large diameter pilot boreholes where casing, screen, and gravel pack were installed without any evidence of borehole wall collapse or migration of native formation materials into the annulus. Under no circumstances shall native aquifer materials be allowed to bridge, slough, or invade the gravel pack during or after installation."

2. Paragraph 3.1.B. ADD the following at the end of item B:
   "If drilling mud or drilling fluid additives are used to maintain borehole stability, the Contractor shall ensure that all additives are properly selected, managed, and approved by the Engineer. Drilling fluids shall be maintained at properties adequate to support the borehole, protect water-bearing formations, and prevent formation-induced drilling problems such as heaving sands or swelling clays."

3. Paragraph 3.2.A. ADD the following at the end of Item A"
   "1. When drilling mud or additives are used, the Contractor shall perform rigorous well development to remove all filter cake or drilling residue from the borehole wall. The finished gravel pack must be in full hydraulic communication with the native aquifer materials. Engineer approved clay dispersants shall be used during development as required. If the well fails to achieve the specified pumping rate following initial development, the Contractor shall perform additional development until performance requirements are met."

NOTE: Bidders must acknowledge receipt of this Addendum by listing the number and date, where provided, on the Bid Form - Document 00410.

CITY OF FOUNTAINS
HEART OF THE NATION
KANSAS CITY
MISSOURI

ADDENDUM NUMBER 5

Project Number 80002543/9911

Project Title Vertical Well 2-5 Replacement

ISSUE DATE: **Feb 4th, 2026**

Bidders are hereby notified that the Bidding and Contract Documents for the above project, for which Bids are to be received on 2/10/2026, are amended as follows:

Information to Bidders: The following information is provided to Bidders for information only:

1. The specifications changes noted in this Addendum are construction requirements as promulgated by the North Kansas City Levee District and the US Army Corps of Engineer's.

Specifications

Section 01015

1. Paragraph 1.22. D. 4. REPLACE item 4 in its entirety with the following: "Excavation work should cease and backfilling start if the groundwater rises to within three feet of the bottom of the excavation. Backfilling must be completed prior to groundwater reaching the excavation depth. Drilling shall be ceased, and boreholes backfilled when the Missouri River at the Kansas City gage (KCDM7) reaches it action state of 29 feet. Boreholes and excavations shall be backfilled at a rate that exceed the rise of gage readings."

Section 02202

1. Paragraph 3.2. I.1. REMOVE the last sentence of the paragraph in its entirety.
2. Paragraph 3.5.A. REPLACE this paragraph with the following: "All trench backfill above pipe embedment and around manholes and concrete vaults shall conform to the following requirements."
3. Paragraph 3.5.B.1 REVISE "95 percent" to "90 percent" in the first sentence.
4. Paragraph 3.5.C. REMOVE this paragraph in its entirety.

Section 02512

1. Paragraph 1.1.B REPLACE this paragraph with the following: "Subgrade preparation shall be as specified in the governing standards or herein."

Section 02522

1. Paragraph 1.1.B REPLACE this paragraph with the following: "Subgrade preparation shall be as specified in the governing standards or herein."

Section 02610

1. Paragraph 1.1.B REPLACE this paragraph with the following:
   "Trenching, bedding, and backfill are covered in the Trenching and Backfill section."
2. Paragraph 3.3.C.1. REPLACE "Excavation and Fill for Structures section" in the first sentence with "Trenching and Backfill section".

Section 02670

1. Paragraph 3.1.M. REPLACE "O-rings." to "rubber O-rings" in the second sentence.
2. Paragraph 3.1.M. ADD the following after the second sentence:
   "Casings must extend at least 1 foot below the bottom of the upper clay blanket."

Section 02850

1. Paragraph 1.2.H. REPLACE "Excavation and Fill for Structures section" with "Trenching and Backfill section".

Section 15108

1. Paragraph 2.1.A. DELETE the third sentence and REPLACE with the following sentence:
   "The valves shall be ARI "No. D-060-HF-NS" without exception."

Drawings:

Drawing VW-D-301

1. Key Note 4. REVISE “CEMENT SLURRY” to “WELL CEMENT GROUT”.

Drawing VW-C-302

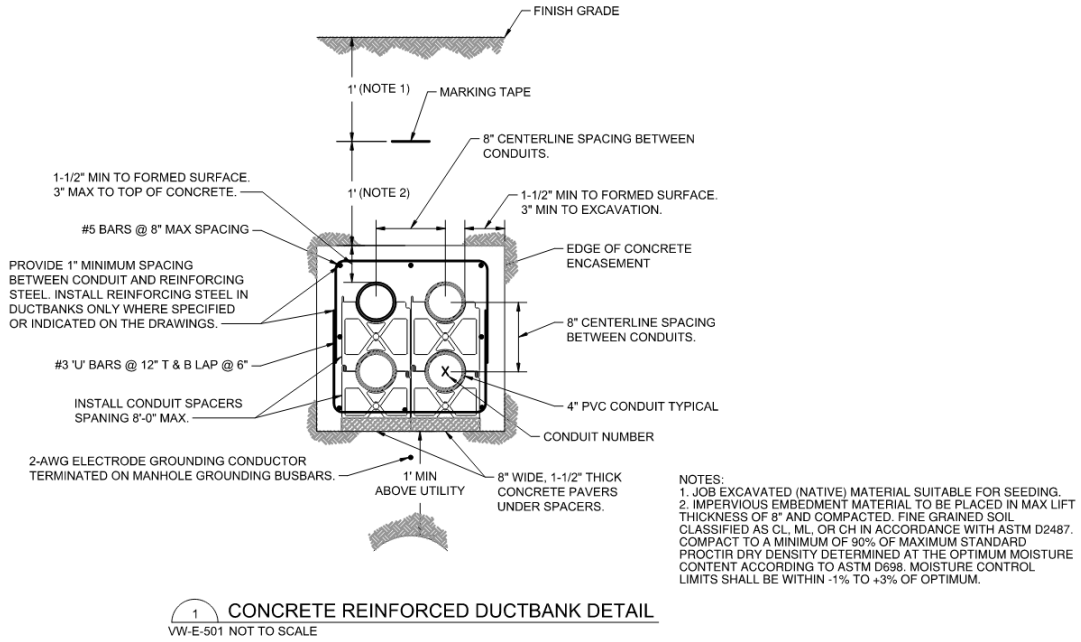
1. General Note 7. REPLACE “O-RINGS” to “RUBBER O-RINGS” in the second sentence.
2. General Note 7. ADD the following after the second sentence:
   “Casings must extend at least 1 foot below the bottom of the upper clay blanket.”
3. General Note 7. ADD the following note after General Note 7:
   “8. Refer to Specification Section 02670 – Water Wells for mix and material requirements for Concrete Grout Fill and Bentonite Clay Grout”.

Drawing VW-C-502

1. DETAIL A. REMOVE “(NOTE 1)” from the CLSM EMBEDMENT callout
2. DETAIL A. REPLACE the callout “IMPERVIOUS MATERIAL (COMPACTED), SEE NOTE 2” to “IMPERVIOUS MATERIAL (COMPACTED), SEE NOTE 1 AND 2.”
3. DETAIL A. ADD the following to end of Note 2:
   “Compact to a minimum of 90% of maximum Standard Proctor dry density determined at the optimum moisture content according to ASTM D698. Moisture control limits shall be within -1% to +3% of optimum.”
4. DETAIL B. REMOVE “(NOTE 1)” from the CLSM EMBEDMENT callout.
5. DETAIL B. REPLACE the callout “COMPACTED EMBEDMENT (NOTE 2)” to “IMPERVIOUS MATERIAL (COMPACTED), SEE NOTE 1 AND 2.”
6. DETAIL B. ADD the following to end of Note 2:
   “Compact to a minimum of 90% of maximum Standard Proctor dry density determined at the optimum moisture content according to ASTM D698. Moisture control limits shall be within -1% to +3% of optimum.”

Drawing VW-E-501

1. DETAIL 1. REPLACE detail 1 in its entirety with the detail below.



NOTE: Bidders must acknowledge receipt of this Addendum by listing the number and date, where provided, on the Bid Form - Document 00410.

CITY OF FOUNTAINS
HEART OF THE NATION
KANSAS CITY
MISSOURI

ADDENDUM NUMBER 6

Project Number 80002543/9911

Project Title Vertical Wells 2 – 5 Replacement

ISSUE DATE: **Feb 6th, 2026**

Bidders are hereby notified that the Bidding and Contract Documents for the above project, for which Bids are to be received on 2/10/2026, are amended as follows:

Q9.	Please confirm whether domestic or AIS materials are required, or if this is optional.
A9.	**Domestic or AIS only requirements are not required.**
Q10.	The spec's call out 5 test holes, when it appears only 4 will be necessary. Please clarify the proper quantity.
A10.	**Four test holes were completed, TH2023-Well- 2R through 5R, by Layne Ranney Collector Wells (see attachment to this Addendum). The locations of these four test holes will be required to be located as specified. Specification section has been revised per this addendum to reflect four test holes instead of five test holes.**
Q11.	Please confirm straight mud rotary drilling is allowed for the test hole drilling.
A11.	**As specified in Section 02670, the acceptable drilling methods are reverse circulation rotary only. Mud rotary drilling and similar liquid drilling methods are required to protect surficial fine-grained blanket materials as specified.**
Q12.	The spec's call out that no mud may be used during the drilling process. While that will be the case on the production wells, can bentonite based mud be using during the test hole drilling? Without it, keeping circulation will be nearly impossible.
A12.	**Test hole drilling is not required. Test holes have been drilled prior for design considerations.**
Q13.	Please confirm that dug, earthen pits will be allowed during production well construction.
A13.	**Excavated pits are not allowed as specified in Section 02670, as well as in 02850 per addition in this addendum.**
Q14.	Standard industry practice is to base the production well screen slot size off of a nearby test hole, while the slot size is already specified in the documents. Will adjustments be made following the drilling of the test holes to insure the slots are appropriately sized? This also will apply to the gravel pack sizing.
A14.	**Test hole drilling is not required. Wells shall be installed in near the existing test hole locations. Screen and gravel pack design has been designed based off these test holes.**

Q15.	It's mentioned in the documents about special protection of the fine grained blanket during drilling. While this is standard protocol on the landward side of the levee, I've never encountered this wording when drilling between the river and the levee. To my knowledge, there is no fine grained blanket in this area, and that the materials have all been naturally deposited. Please clarify if the additional measures are actually necessary when drilling in this area.
A15.	**This is a requirement per the North Kansas City Levee District and US Army Corp of Engineer. See clarification and addition to Section 02670 included in this addendum to propose alternative methods.**
Q16.	The development methods as specified are inferior to newer technologies. We prefer to use high-velocity jetting with concurrent pumping for the development procedure. This method also removes the need for chemicals as described in stage 3 of the development. Please confirm that our proposed method will be allowed in lieu of the methods specified.
A16.	**Specification section 02670 3.2 states the Contractor may suggest alternate well development techniques that are to submitted in a well development workplan and are subject to Engineer acceptance. Alternative methods will be approved during construction. Clay dispersants will be required if fine materials have been deposited on the borehole wall during the drilling process.**
Q17.	Please confirm that pumping test water can be directed to the river.
A17.	**Pump test water shall not be directly discharged into the river. Water may be discharged to the river after meeting erosion control requirements specified and as required by regulatory requirements.**
Q18.	Please confirm that a magnetic flow meter is acceptable during the pumping tests.
A18.	**Magnetic flow meters are acceptable to measure flow during pumping tests.**
Q19.	The well video section mentions being "capable of passing through the screen". Obviously, the camera and it's lighting will only be able to see to the screen slots, not through them at any distance. Gravel pack beyond the slot may or may not be visible. Please clarify that is acceptable.
A19.	**This requirement has been removed from the specifications.**
Q20.	Please confirm that the supply voltage will be stepped down to 480V to supply the water well pumps.
A20.	**Water well pumps power shall be 2400 volts as specified in Section 11145.**
Q21.	Requesting exception to the seismic design requirements. This area is very low risk for earthquakes. Please advise if this requirement will be removed from the spec.
A21.	**Seismic design is required as specified. Section 01611.3 Meteorological and Seismic Design Criteria was added via prior clarification.**
Q22.	77% wire to water efficiency is unachievable to my knowledge on these pumps. Please advise if the engineer has a supplier known to be able to meet this, or is willing to modify the spec.

A22.	**Efficiency was specified based off known suppliers that meet the specified pump conditions. Supplied pump shall within 10% the minimum efficiency specified. Therefore, minimum efficiency shall be 67%.**
Q23.	The pump column material is unclear, and both 316ss and A53B steel are mentioned with pump column descriptions. Please clarify which is applicable. I would prefer 304 ss in this application for longevity. 316 isn't really necessary since it is not a high chloride environment.
A23.	**Pump Discharge column shall be ASTM A53 Grade A as specified. The anchor bolts, nuts, and washers for the pump column assembly shall be 316 Stainless steel as specified.**
Q24.	The pump column is specified as flanged. Would double spline connection as made by Roscoe Moss be acceptable in lieu of flanged?
A24.	**Pump column shall be flanged as specified.**
Q25.	I am unable to find a check valve to meet the specifications. Please advise if the engineer has a supplier known to be able to meet this.
A25.	**Check valve shall be provided by the pump manufacturer as a part of their pump package.**
Q26.	The base thickness and wall thickness are not specified. Will that be left up to the precast standard design?
A26.	**Minimum wall and slab thicknesses of 8" are required. This has been added per this addendum. Design of the precast vaults are the responsibility of the Contractor and shall meet the requirements specified in Section 02610.**
Q27.	Are we not able to use earthen pits?
A27.	**Earthen pits are not allowed per Section 02850 added via this addendum and as specified in Section 02670.**
Q28.	Are there test boring logs available for us to look at the formation?
A28.	**Borelog and sieve analysis documents have been attached to this addendum.**
Q29.	What water supply is available for drilling 1st well?
A29.	**Water is available at the Intake Pump Station on site. Refer to Section 01500.**
Q30.	Do you know what rate the well driller wage will be?
A30.	**Wage rates shall be for Heavy Construction in Clay County.**
Q31.	Where should the development and test pump water be pumped to?
A31.	**Pump test water shall not be directly discharged into the river. Water may be discharged to the river after meeting erosion control requirements specified and as required by regulatory requirements.**
Q32.	Who is the hydrogeologist that designed the wells?
A32.	**Layne Ranney Collector Wells performed the test wells and report.**
Q33.	Are we able to use drilling fluids if approved by the engineer beforehand?

A33.	**Coordination with the North Kansas City Levee District and US Army Corp of Engineer will be required if an alternative method of protecting the surficial fine-grain blanket material is proposed. See clarification and addition to Section 02670 regarding alternative drilling methods through the fine grained fluids.**
Q34.	Can we use 8" CMU blocks or bricks to hold up the pipe? In lieu of the 4'x4' precast blocks. [In reference to Detail A on VW-C-502]
A34.	**CMU blocks are not allowed. Blocks shall be impervious and solid. However, the size of the block has been revised to 16"L x16"Wx8"H per this addendum.**

Specifications

1. Under Section 02610 – Precast Vaults, PART 2 – PRODUCTS, 2.2 Vault Manufacturer. B. ADD the item 3 under item 2: "3. Wall and slab thicknesses shall be a minimum of 8 inches."

2. Under Section 02670 – Water Wells, PART 3 – GENERAL, 3.1 Drilling Method, A., REVISE "five (5)" to "four (4)".

3. Under Section 02670 – Water Wells, PART 3 – GENERAL, 3.12 VIDEO SURVEY AND INSPECTION: REMOVE final sentence "Video equipment shall be capable of passing through the screen." in its entirety.

4. Section 02670

    1. Paragraph 3.1.C.: Delete the second sentence and replace with the following second sentence: "The drilling method shall be reverse circular rotary without exception."

5. Under Section 02850 - Erosion and Sediment Control, PART 2 – PRODUCTS, ADD the following: "B. Excavated pits shall not be allowed for sedimentation/infiltration purposes."

Drawings:

1. Drawing VW-C-301. ADD the following to the end of General Note 2: "Wall and slab thicknesses shall be a minimum of 8 inches".

2. Drawing VW-C-502. REPLACE "*4'x4'x8'*"" with "16" L x 16" W x8" H" in Detail A Pipe Embedment and Compacted Trench Backfill.

NOTE: Bidders must acknowledge receipt of this Addendum by listing the number and date, where provided, on the Bid Form - Document 00410.

Layne
A GRANITE COMPANY

RANNEY COLLECTOR WELLS
6360 HUNTLEY ROAD
COLUMBUS, OHIO 43229
614-888-6263

FIELD BOREHOLE LOG

BOREHOLE NO.: **TH2023-WELL-2R**
TOTAL DEPTH: **128 feet**

CLIENT: KCMO
SITE LOCATION: Vertical Well Field
-
COORDINATES: NA NA NA
TOP OF CASING ELEVATION: NA
GRADE ELEVATION: NA

JOB NO.: 1055052
DATE DRILLED: 3/21/2022 - 3/22/2023
GEOLOGIST: Emmanuel Adedugbe
DRILLER: Andy Kritzeck, Traut Companies.
BORING DIAMETER: 6 inches
DRILLING METHOD: Track Sonic

NOTES: Black and Veatch Corporation

Grout Hole with Ez-Seal Bentonite

DEPTH (feet)	ELEVATION (feet)	LITHOLOGY	RECOVERY	WELL CONSTRUCTION
0	0	SILTY-CLAY (CL) light brown, moist, very soft clay and silt	0 to 10 feet, 7 feet recovery	
5	-5	SILTY-SAND (SM) light brown, moist, very fine-grained sand with little silt		
10	-10	CLAY (CH) olive gray, moist, very stiff clay	10 to 20 feet, 10 feet recovery	
15	-15	CLAYEY-SLLTY-SAND (SC) light brown, moist, very fine-grained sand with silt and clay		
		SILTY-SAND (SM) light brown, moist, very fine-grained sand mostly fine and some silt		
20	-20	SILTLY-SAND (SP-SM) light brown, moist, very fine-grained sand (uniform) with few silt	20 to 30 feet, 10 feet recovery	
25	-25	SILTLY-SAND (SW-SM) light brown, moist, very fine to coarse-grained sand mostly fine with trace few		
30	-30	GRAVELY-SAND (SW_SM) dark brown, wet, very fine to fine-grained sand mostly medium with few fine to coarse subangular to subrounded gravel. Gravel mostly coarse.	30 to 40 feet, 10 feet recovery	
35	-35	SILTLY-SAND (SP-SM) light brown, moist, very		

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FIELD BOREHOLE LOG

BOREHOLE NO.: **TH2023-WELL-2R**

TOTAL DEPTH: **128 feet**

DEPTH (feet)	ELEVATION (feet)	LITHOLOGY	RECOVERY	WELL CONSTRUCTION
		SILTLY-SAND (SP-SM) light brown, moist, very fine-grained sand (uniform) with few silt		
		GRAVELY-SAND (SW) tannish to brown, wet, fine to coarse-grained sand mostly medium (45-55%) and scattered trace fine subangular to subrounded gravel		
40	-40	GRAVELY-SAND (SW) tannish to brown, wet, fine to coarse-grained sand mostly medium (45-55%) and scattered trace fine subangular to subrounded gravel	40 to 50 feet, 10 feet recovery	
		SILTY-SAND (SP-SM) orangish to light gray, wet, fine-grained sand with few silt		
45	-45			
50	-50	SILTY-SAND (SP-SM) gray, wet, fine-grained sand with few silt	50 to 60 feet, 10 feet recovery	
		GRAVELY-SAND (SW) dark gray, wet, loose fine to coarse grained sand mostly coarse and few scattered fine subangular gravel		
		SILTY-SAND (SP-SM) dark gray, wet, very fine-grained sand with few silt		
55	-55	GRAVELY-SAND (SW-SM) dark gray, wet, fine to coarse grained sand mostly coarse and little fine to coarse subangular to well-rounded gravel. Gravel mostly fine (15-25%)		
		GRAVELLY-CLAYEY-SAND (SP-SC) dark gray, wet, very fine to medium-grained sand mostly fine with few clay and trace scattered coarse subangular gravel. 3-inches Clay from 55.1 to 55.4 feet		
60	-60	CLAY (CH) dark gray, wet, very stiff clay	60 to 70 feet, 10 feet recovery	
		GRAVELY-SAND (SW-SM) gray, wet, fine to coarse grained sand mostly medium with few silt and trace scattered fine gravel		
		GRAVELY-SAND (SW) brown, wet, fine to coarse grained sand mostly medium(15-25%) and coarse (30-40) and little fine to coarse subangular to rounded gravel. Gravel is mostly fine (15-20%)		
65	-65			
		GRAVELY-SAND (SW) brown, wet, fine to coarse grained sand mostly medium(40-50%) and coarse (20-25) and few fine to coarse subrounded to rounded gravel mostly fine (5-10%)		
70	-70	GRAVELY-SAND (SW) brown, wet, fine to coarse grained sand mostly medium(40-50%) and coarse (20-25) and few fine to coarse subrounded to rounded gravel mostly fine (5-10%)	70 to 80 feet, 10 feet recovery	
75	-75			
		GRAVELY-SAND (GW) tannish, wet, fine to coarse grained sand mostly coarse with fine to coarse subangular to well-rounded gravel. Gravel mostly		

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FIELD BOREHOLE LOG

BOREHOLE NO.: **TH2023-WELL-2R**

TOTAL DEPTH: **128 feet**

DEPTH (feet)	ELEVATION (feet)	LITHOLOGY	RECOVERY	WELL CONSTRUCTION
		subangular to well-rounded gravel. Gravel mostly coarse (25-35%), medium and fine (10-15%) each		
80	-80	SAND (SP) brown, wet, loose fine to coarse grained sand mostly fine (50-60%) and medium (20-25%)	80 to 90 feet, 10 feet recovery	
		GRAVELY-SAND (SW) brown, wet, loose fine to coarse grained sand mostly coarse (30-40%) and medium (20-30%) with trace fine subangular gravel		
85	-85	GRAVELY-SAND (GW-GM) brown, wet, loose fine to coarse grained sand mostly coarse (20-30%) and medium (10-15%) with fine to coarse subangular to well-rounded gravel. Gravel mostly fine (15-25%) and coarse (10-15%)		
		GRAVELY-SAND (GM) brown, wet, loose fine to coarse grained sand mostly coarse (25-35%) and medium (15-25%) with fine to coarse subangular to well-rounded gravel. Gravel mostly fine (10-15%) and coarse (5-10%) and trace silt		
90	-90	GRAVELY-SAND (GM) brown, wet, loose fine to coarse grained sand mostly coarse (25-35%) and medium (15-25%) with fine to coarse subangular to well-rounded gravel. Gravel mostly fine (10-15%) and coarse (5-10%) and trace silt	90 to 100 feet, 9 feet recovery	
95	-95	SAND-GRAVELY (GW) light brown, wet, loose fine to coarse subrounded to well-rounded gravel mostly coarse (25-35%) and medium (10-15%) with little fine to coarse-grained sand mostly fineand medium		
		GRAVELY-SAND (SP) light brown, wet, loose fine to coarse grained sand mostly fine and medium (30-40%) each with trace scattered medium subangular gravel		
100	-100	SAND-GRAVELY (GW) brown, wet, loose fine to coarse gravel mostly fine (30-40%) and medium (15-25%) with little fine to coarse-grained sand mostly coarse (10-15%) and medium (5-10%)	100 to 110 feet, 10 feet recovery	
		SAND-GRAVELY (GW) brown, wet, loose fine to coarse gravel mostly fine (30-40%) and medium (15-25%) with little fine to coarse-grained sand mostly coarse (10-15%) and medium (5-10%)		
105	-105			
		SAND-GRAVELY (GP) brown, wet, loose fine to coarse well-rounded gravel mostly fine (50-60%) and medium (10-15%) with few fine to coarse-grained sand. Sand mostly coarse (5-10%)		
110	-110	GRAVELY-SAND (GW-GM) brown, wet, fine to coarse grained sand mostly fine (35-45%) and medium (20-30%) with few fine to coarse gravel. Gravel mostly fine (5-10%)	110 to 120 feet, 10 feet recovery	
		GRAVELY-SAND (GW-GM) brown, wet, fine to coarse grained sand mostly fine (35-45%) and medium (20-30%) with few fine to coarse gravel. Gravel mostly fine (5-10%)		
115	-115	SILTY-SAND-GRAVELY (GP-GM) brown, wet, loose fine to coarse subangular to well-rounded gravel mostly fine (30-40%) and medium (15-25%) with little fine to coarse grained sand mostly coarse (15-20%) and few silt		
		SILTY-SAND-GRAVELY (GP-GM) dark brown, wet, loose fine to coarse subangular to well-rounded gravel mostly fine (20-30%) and medium (15-25%) with little fine to coarse grained sand mostly coarse (15-20%) and few silt. Materials oarsening with depth.		
120	-120		120 to 128	

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614-888-6263

FIELD BOREHOLE LOG

BOREHOLE NO.: **TH2023-WELL-2R**

TOTAL DEPTH: **128 feet**

DEPTH (feet)	ELEVATION (feet)	LITHOLOGY	RECOVERY	WELL CONSTRUCTION
125	-125	mostly fine (30-40%) and medium (15-25%) with little fine to coarse grained sand mostly coarse (15-20%) and few silt		
		SILTY-SAND-GRAVELY (GP-GM) dark brown, wet, loose fine to coarse subangular to well-rounded gravel mostly fine (20-30%) and medium (15-25%) with little fine to coarse grained sand mostly coarse (15-20%) and few silt. Materials oarsening with depth.		
		SILTY-SAND-GRAVELY (GP-GM) dark brown, wet, loose fine to coarse subangular to well-rounded gravel mostly fine (20-30%) and medium (15-25%) with little fine to coarse grained sand mostly coarse (15-20%) and few silt. Materials oarsening with depth.		
		SILTY-SAND-GRAVELY (GP-GM) grayish to brown, wet, loose fine to coarse subrounded to well-rounded gravel mostly medium (20-30%) and coarse (15%) with little fine to coarse grained sand mostly coarse (10-15%) and few silt. Materials oarsening with depth.		
		WEATHERED TO COMPETENT BEDROCK, gray, moist, shale		

TH2023-WELL-2R KCMO Borehole Materials - Kansas City, Missouri



4 - 7 feet



7 - 10 feet



11 - 14 feet



14 - 17 feet

TH2023-WELL-2R KCMO Borehole Materials - Kansas City, Missouri



17 - 20 feet



22 -26 feet



26 - 28 feet



28 - 30 feet

TH2023-WELL-2R KCMO Borehole Materials - Kansas City, Missouri



33 - 36 feet



36 - 40 feet



42 - 45 feet



45 - 48 feet

TH2023-WELL-2R KCMO Borehole Materials - Kansas City, Missouri



48 - 50 feet



50 - 53 feet



53 - 56 feet



56 - 60 feet

TH2023-WELL-2R KCMO Borehole Materials - Kansas City, Missouri



62 - 64 feet



64 - 67 feet



67 - 70 feet



72 - 76 feet

TH2023-WELL-2R KCMO Borehole Materials - Kansas City, Missouri



76 - 78 feet



78 - 80 feet



80 - 83 feet



83 - 86 feet

TH2023-WELL-2R KCMO Borehole Materials - Kansas City, Missouri



86 - 90 feet



94 - 97 feet



97 - 100 feet



101 - 104 feet

TH2023-WELL-2R KCMO Borehole Materials - Kansas City, Missouri



104 - 107 feet



107 - 110 feet



112 - 115 feet



115 – 118 feet

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FIELD BOREHOLE LOG

BOREHOLE NO.: **TH2023-WELL-3R**

TOTAL DEPTH: **109 feet**

CLIENT: KCMO

SITE LOCATION: Vertical Well Field

COORDINATES: NA NA NA

TOP OF CASING ELEVATION: NA

GRADE ELEVATION: NA

JOB NO.: 1055052

DATE DRILLED: 3/23/2023

GEOLOGIST: Emmanuel Adedugbe

DRILLER: Andy Kritzeck, Traut Companies.

BORING DIAMETER: 6 inches

DRILLING METHOD: Track Sonic

NOTES: Black and Veatch Corporation

Grout Hole with Ez-Seal Bentonite

DEPTH (feet)	ELEVATION (feet)	LITHOLOGY	RECOVERY	WELL CONSTRUCTION
0	0	GRAVELY-CLAY/OVERBURDEN dark brown, moist, clay mixed with gravel.	0 to 10 feet, 10 feet recovery	
5	-5	SILTY-SAND (SM) light brown, moist, very fine-grained sand with little silt		
10	-10	SILTY-SAND (SM) light brown, moist, very fine-grained sand with little silt	10 to 20 feet, 8 feet recovery	
15	-15	SANDY-SLLTY-CLAY (CH-CL) dark gray, moist, soft clay with few silt and sand		
		CLAY (CH) dark gray, moist, stiff clay		
20	-20	CLAY (CH) dark gray to brown, moist, stiff clay	20 to 30 feet, 10 feet recovery	
25	-25	SANDY-SLLTY-CLAY (CH-CL) brown, moist, stiff to soft clay with few silt and sand		
		SILTY-SAND (SM) light brown, moist, very fine-grained sand with little silt		
30	-30	SILTY-SAND (SM) light brown, moist, very fine-grained sand with little silt	30 to 40 feet, 10 feet recovery	
35	-35			

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FIELD BOREHOLE LOG

BOREHOLE NO.: **TH2023-WELL-3R**

TOTAL DEPTH: **109 feet**

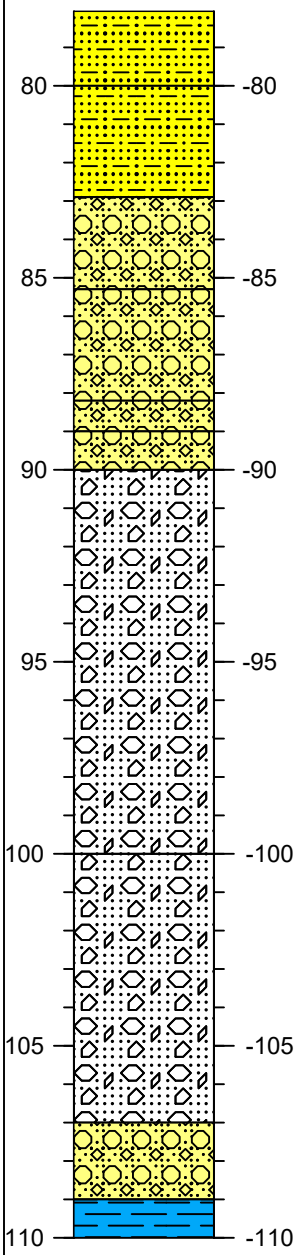
DEPTH (feet)	ELEVATION (feet)	LITHOLOGY	RECOVERY	WELL CONSTRUCTION
40	-40	GRAVELY-SAND (SW-SM) brown, wet, loose fine to coarse grained sand mostly fine (35-45%) and medium (25-35%) with trace scattered fine to medium gravel. Gravel mostly medium.		
		GRAVELY-SILTY-SAND (SW-SM) dark brown, wet, fine to coarse grained sand mostly fine (50-60%) and medium (5-15%) with few silts and trace fine to coarse gravel	40 to 50 feet, 9 feet recovery	
45	-45	GRAVELY-SAND (SW-SM) brown, wet, loose fine to coarse grained sand mostly fine (35-45%) and medium (25-35%) with trace scattered fine to medium gravel. Gravel mostly medium.		
		SILTY-SAND (SP-SM) yellow to orangish, wet, very fine to fine-grained sand with few silt		
50	-50	SILTY-GRAVELY-SAND (SW) brown, wet, loose very fine to coarse-grained sand mostly fine (50-60%), medium (20-30%) and few fine to coarse subrounded gravel mostly medium (5-8%), fine (2-5%) and trace silt	50 to 60 feet, 10 feet recovery	
		SILTY-GRAVELY-SAND (SW) brown, wet, loose very fine to coarse-grained sand mostly fine (50-60%), medium (20-30%) and few fine to coarse subrounded gravel mostly medium (5-8%), fine (2-5%) and trace silt		
55	-55	SILTY-SAND (SP-SM) yellow to orangish, wet, very fine to fine-grained sand with few silt		
60	-60	SILTY-SAND (SP-SM) yellow to orangish, wet, very fine to fine-grained sand with few silt. Material is hieving	60 to 70 feet, 3 feet recovery	
65	-65			
70	-70	CLAYEY-GRAVELLY-SILTY-SAND (SC) yellowish-orange to gray, wet, very fine to coarse-grained sand mostly very fine and fine with little silt, trace fine to coarse subrounded to rounded gravel and trace clay	70 to 80 feet, 10 feet recovery	
		CLAY (CH) dark gray, wet, very stiff clay		
75	-75	SILTY-GRAVELLY-CLAYEY-SAND (GC) dark gray, wet, very fine to coarse-grained sand mostly medium (20-30%) and coarse (5-15%) with little clay, few fine to coarse subrounded gravel and few silt		

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FIELD BOREHOLE LOG

BOREHOLE NO.: **TH2023-WELL-3R**

TOTAL DEPTH: **109 feet**



DEPTH (feet)	ELEVATION (feet)	LITHOLOGY	RECOVERY	WELL CONSTRUCTION
80	-80	SILTY-SAND (SP-SM) dark gray, wet, very fine-grained sand with few silt		
		SILTY-SAND (SP) light gray, wet, very fine to fine-grained sand mostly fine (uniform) with few silt	80 to 90 feet, 10 feet recovery	
85	-85	GRAVELY-SILTY-SAND, yellowish-orange brown, wet, very fine to coarse grained sand mostly fine (50-60%) and medium (20-30%) with few silt (<10%) and ocassional trace fine gravel (<5%)		
		SILTY-GRAVELY-SAND (GM) blackish-gray, wet, fine to coarse grained sand mostly fine (25-35%) and medium (15-20%) with little fine to coarse well-rounded gravel mostly fine (10-15%), medium and coarse (<10%) each and few silt (<10%)		
90	-90	GRAVELY-SILTY-SAND (SP) light gray, wet, fine to coarse grained sand mostly fine (65-75%), medium and coarse (<15%) with few silt and scattered trace fine to coarse rounded gravel	90 to 100 feet, 9 feet recovery	
		SILTY-GRAVELY-SAND (GM) gray, wet, fine to coarse grained sand mostly coarse (15-25%), fine (10-15%) medium (5-10%) with little fine to coarse well-rounded gravel mostly coarse (10-20%), fine (5-15%) and few silt (<10%)		
95	-95	GRAVELY-SAND (GW-GM) light gray, wet, fine to coarse grained sand mostly coarse (20-30%) and medium (10-15%) with some scattered fine to coarse rounded to well-rounded gravel. Gravel mostly fine (15-25%) and coarse (<10-%)		
100	-100	GRAVELY-SAND (GW-GM) light brown, wet, loose fine to coarse grained sand mostly coarse (20-30%) and medium (15-25%) with little scattered fine to coarse well-rounded gravel. Gravel mostly fine (10-20%), medium and coarse (5%) each	100 to 109 feet, 9 feet recovery	
105	-105	SILTY-SAND-GRAVELY (GW) light brown to light gray, wet, loose fine to coarse well-rounded gravel mostly coarse (20-30%), fine (10-20%) and medium (5-15%) with some fine to coarse grained sand mostly coarse (15-25%) and medium(10-15%) and trace silt Materials oarsening with depth.		
110	-110	COMPETENT BEDROCK, gray, moist, shale		

TH2023-WELL-3R KCMO Borehole Materials - Kansas City, Missouri



2 - 5 feet



5 - 10 feet



14 - 17 feet



17 - 20 feet

TH2023-WELL-3R KCMO Borehole Materials - Kansas City, Missouri



21 - 24 feet



24 -27 feet



27 - 30 feet



33 - 36 feet

TH2023-WELL-3R KCMO Borehole Materials - Kansas City, Missouri



36 - 40 feet



44 - 47 feet



47 - 50 feet



50 - 54 feet

TH2023-WELL-3R KCMO Borehole Materials - Kansas City, Missouri



53 - 57 feet



57 - 60 feet



68 - 70 feet



71 - 73 feet

TH2023-WELL-3R KCMO Borehole Materials - Kansas City, Missouri



73 - 76 feet



76 - 80 feet



83 - 86 feet



86 - 90 feet

TH2023-WELL-3R KCMO Borehole Materials - Kansas City, Missouri



92 - 95 feet



95 - 98 feet



98 - 100 feet



100 - 103 feet

TH2023-WELL-3R KCMO Borehole Materials - Kansas City, Missouri



103 - 106 feet



106 - 109 feet

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FIELD BOREHOLE LOG

BOREHOLE NO.: **TH2023-WELL-4R**

TOTAL DEPTH: **119 feet**

CLIENT: KCMO

SITE LOCATION: Vertical Well Field

-

COORDINATES: NA NA NA

TOP OF CASING ELEVATION: NA

GRADE ELEVATION: NA

JOB NO.: 1055052

DATE DRILLED: 3/22/2023 - 3/23/2023

GEOLOGIST: Emmanuel Adedugbe

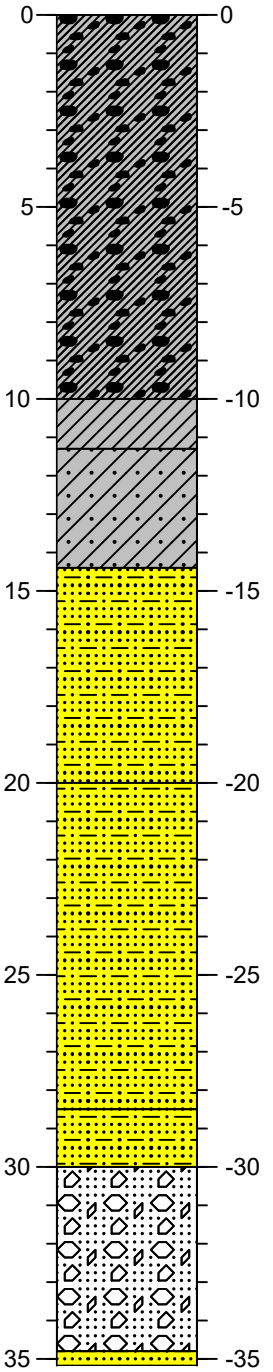
DRILLER: Andy Kritzeck, Traut Companies.

BORING DIAMETER: 6 inches

DRILLING METHOD: Track Sonic

NOTES: Black and Veatch Corporation

Grout Hole with Ez-Seal Bentonite



DEPTH (feet)	ELEVATION (feet)	LITHOLOGY	RECOVERY	WELL CONSTRUCTION
0	0	GRAVELY-SANDY-SILTY-CLAY/OVERBURDEN (OL-OH) dark brown, moist, organic soil, clay, silt, few sand and trace coarse gravel	0 to 10 feet, 6 feet recovery	
10	-10	CLAY (CH) dark brown, moist, stiff clay	10 to 20 feet, 10 feet recovery	
		CLAYEY-SLLTY-SAND (SC) dark brown, moist, very fine grained sand with some silt and little clay		
15	-15	SILTY-SAND (SM) dark brown, moist, loose very fine-grained sand with little silt		
20	-20	SILTY-SAND (SM) dark brown, moist, loose very fine-grained sand (uniform) with few silt	20 to 30 feet, 10 feet recovery	
25	-25			
30	-30	SILTY-SAND (SP-SM) brown, wet, loose very fine to coarse-grained sand mostly fine with trace silt		
		GRAVELY-SAND (SW-SM) brown, wet, fine to coarse grained sand mostly fine and medium with trace scattered fine subangular gravel	30 to 40 feet, 10 feet recovery	
35	-35	SILTY-SAND (SP) dark brown, wet, loose very fine to		

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FIELD BOREHOLE LOG

BOREHOLE NO.: **TH2023-WELL-4R**

TOTAL DEPTH: **119 feet**

DEPTH (feet)	ELEVATION (feet)	LITHOLOGY	RECOVERY	WELL CONSTRUCTION
40	-40	SILTY-SAND (SP) dark brown, wet, loose very fine to medium-grained sand mostly fine (uniform) with trace silt		
		GRAVELY-SAND (SP) dark brown to brown, wet, loose fine to coarse grained sand mostly medium (50-60%), fine (20-30%) with trace fine well-rounded gravel	40 to 50 feet, 10 feet recovery	
45	-45			
50	-50	GRAVELY-SAND (SP) dark brown to brown, wet, loose fine to coarse grained sand mostly medium (50-60%), fine (20-30%) with trace fine well-rounded gravel	50 to 60 feet, 10 feet recovery	
		SILTY-SAND (SP) yellowish-orange, wet, very fine to coarse-grained sand mostly fine (80-90%) with trace silt		
55	-55	SILTY-SAND (SP) yellowish-orange, wet, very fine-grained sand (uniform) with trace silt		
		GRAVELY-SAND (SP) dark brown to brown, wet, loose fine to coarse grained sand mostly medium (50-60%), fine (20-30%) with trace fine well-rounded gravel		
		SILTY-SAND (SP) yellowish-orange, wet, very fine to coarse-grained sand mostly fine (80-90%) with trace silt		
60	-60	GRAVELY-SAND (SP) dark brown to brown, wet, loose fine to coarse grained sand mostly medium (50-60%), fine (20-30%) with trace fine well-rounded gravel	60 to 70 feet, 10 feet recovery	
		SILTY-SAND (SP) yellowish-orange, wet, very fine to coarse-grained sand mostly fine (80-90%) with trace silt		
65	-65	GRAVELY-SAND (SW) yellowish-orange, wet, very fine to coarse grained sand mostly fine (40-50%) and medium (15-25%) with few fine to coarse subrounded to rounded gravel. Gravel mostly coarse (<10%)		
		SILTY-SAND (SW-SM) grayish-brown, wet, very fine to coarse grained sand mostly medium (35-45%) and fine (25-35%) with trace silt		
70	-70	SILTY-SAND (SP) gray, wet, very fine to coarse grained sand mostly fine (75-85%) with trace silt	70 to 80 feet, 10 feet recovery	
		SILTY-SAND (SP) gray, wet, very fine to coarse grained sand mostly fine (75-85%) with trace silt		
75	-75	GRAVELY-SAND (SP) yellowish-orange, wet, fine to coarse-grained sand mostly medium(55-65%) and fine (15-25%) with trace fine rounded gravel		

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FIELD BOREHOLE LOG

BOREHOLE NO.: **TH2023-WELL-4R**

TOTAL DEPTH: **119 feet**

DEPTH (feet)	ELEVATION (feet)	LITHOLOGY	RECOVERY	WELL CONSTRUCTION
80	-80	GRAVELY-SAND (SP) yellowish-orange, wet, fine to coarse-grained sand mostly medium(55-65%) and fine (15-25%) with trace fine rounded gravel		
		SILTY-GRAVELY-SAND (GM) grayish-brown, wet, loose fine to coarse grained sand mostly coarse (25-35%) and medium(15-20%) with some fine to coarse rounded to well-rounded gravel mostly fine (15-25%) and coarse (10-20%), and few silt (<10%). 2.5-inch gravel found at 80 feet	80 to 90 feet, 10 feet recovery	
85	-85	SILTY-GRAVELY-SAND (GW-GM) orangish to brown, wet, loose fine to coarse grained sand mostly coarse (25-35%) and medium (10-15%) with some fine to coarse rounded to well-rounded gravel mostly fine (10-20%), coarse (10-15%) and medium (5-10%) and few silt (<10%)		
90	-90	SILTY-GRAVELY-SAND (GW-GM) light gray, wet, loose fine to coarse grained sand mostly coarse (30-40%) and medium (5-10%) with some fine to coarse rounded to well-rounded gravel mostly fine (15-25%), coarse (5-10%) and trace few silt. Coarsening with depth	90 to 100 feet, 10 feet recovery	
95	-95	SILTY-SAND-GRAVELY (GW) light gray, wet, loose fine to coarse rounded to well-rounded gravel mostly coarse (15-20%), fine and medium (10-15%) each, with some fine to coarse grained sand mostly coarse (10-25%) and medium(5-15%) and trace silt. Materials coarsening with depth.		
100	-100	SILTY-GRAVELY-SAND (SW)gray, wet, loose very fine to coarse-grained sand mostly fine (40-50%), medium (20-30%) with trace fine well-rounded gravel and trace silt	100 to 110 feet, 10 feet recovery	
		SILTY-GRAVELY-SAND (GP-GM) gray, wet, loose fine to coarse-grained sand mostly coarse (25-35%) and medium (10-15%) with some fine to coarse well-rounded gravel mostly fine (15-25%), medium(5-10%) and coarse (<10%) and trace silt		
105	-105	SILTY-GRAVELY-SAND (GW-GM) gray, wet, loose fine to coarse rounded to well-rounded gravel mostly medium(10-20%), fine and coarse (5-15%) each with some fine to coarse grained sand mostly coarse (10-20%) and medium (5-15%) few silt (<10%)		
110	-110	SILTY-GRAVELY-SAND (GW-GM) gray, wet, loose fine to coarse-grained sand mostly coarse (10-20%), fine (5-15%) and medium (5-10%) with little fine to coarse rounded to well-rounded gravel mostly coarse (5-15%), medium(5-10%) and few silt (>10%)	110 to 119 feet, 9 feet recovery	
		SILTY-GRAVELY-SAND (GP-GM) gray, wet, loose fine to coarse-grained sand mostly coarse (20-30%)and medium (5-15%) with some fine to coarse rounded to well-rounded gravel mostly fine (10-20%), medium (5-15%) and coarse (<10%) and trace silt		
115	-115	SILTY-GRAVELY-SAND (GP-GM) gray, wet, loose fine to coarse-grained sand mostly coarse (20-30%)and medium (5-15%) with some fine to coarse rounded to well-rounded gravel mostly fine (10-20%), medium (5-15%) and coarse (<10%) and trace silt. Coarsening with depth		
120	-120	COMPETENT BEDROCK, gray, moist, shale		

TH2023-WELL-4R KCMO Borehole Materials - Kansas City, Missouri



4 - 7 feet



7 - 10 feet



12 - 14 feet



14 - 17 feet

TH2023-WELL-4R KCMO Borehole Materials - Kansas City, Missouri



17 - 20 feet



23 -26 feet



26 - 30 feet



34 - 37 feet

TH2023-WELL-4R KCMO Borehole Materials - Kansas City, Missouri



37 - 40 feet



44 - 47 feet



47 - 50 feet



50 - 53 feet

TH2023-WELL-4R KCMO Borehole Materials - Kansas City, Missouri



53 - 57 feet



57 - 60 feet



60 - 63 feet



63 - 66 feet

TH2023-WELL-4R KCMO Borehole Materials - Kansas City, Missouri



66 - 70 feet



73 - 76 feet



76 - 78 feet



78 - 80 feet

TH2023-WELL-4R KCMO Borehole Materials - Kansas City, Missouri



83 - 85 feet



85 - 88 feet



88 - 90 feet



92 - 95 feet

TH2023-WELL-4R KCMO Borehole Materials - Kansas City, Missouri



95 - 98 feet



98 - 100 feet



100 – 103 feet



103 - 106 feet

TH2023-WELL-4R KCMO Borehole Materials - Kansas City, Missouri



106 - 110 feet



110 - 113 feet



113 - 116 feet



116 – 119 feet

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FIELD BOREHOLE LOG

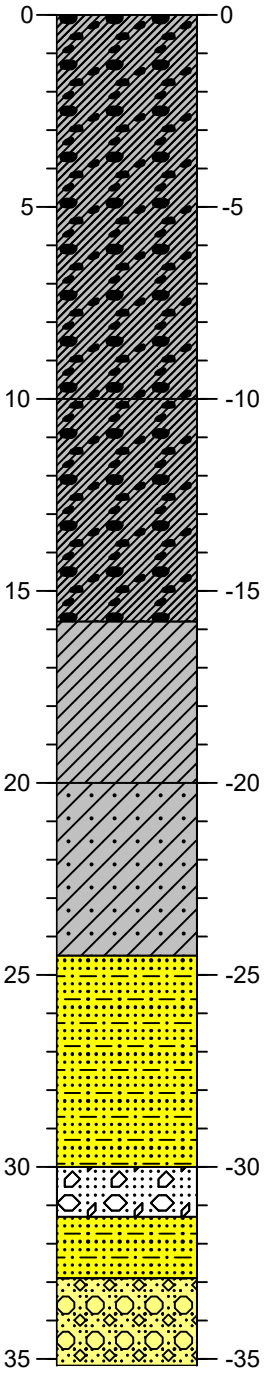
BOREHOLE NO.: **TH2023-WELL-5R**
TOTAL DEPTH: **113 feet**

CLIENT: KCMO
SITE LOCATION: Vertical Well Field
-
COORDINATES: NA NA NA
TOP OF CASING ELEVATION: NA
GRADE ELEVATION: NA

JOB NO.: 1055052
DATE DRILLED: 3/22/2023
GEOLOGIST: Emmanuel Adedugbe
DRILLER: Andy Kritzeck, Traut Companies.
BORING DIAMETER: 6 inches
DRILLING METHOD: Track Sonic

NOTES: Black and Veatch Corporation

Grout Hole with Ez-Seal Bentonite



DEPTH (feet)	ELEVATION (feet)	LITHOLOGY	RECOVERY	WELL CONSTRUCTION
0	0	GRAVELY-CLAY/OVERBURDEN (OL-OH) dark brown, moist, organic soil, clay mixed with coarse gravel	0 to 10 feet, 5 feet recovery	
10	-10	GRAVELY-CLAY/OVERBURDEN (OL-OH) dark brown, moist, organic soil, clay mixed with coarse gravel	10 to 20 feet, 6 feet recovery	
15	-15	CLAY (CH) dark gray, moist, soft clay		
20	-20	CLAYEY-SLLTY-SAND (SC) gray to dark brown, moist, very fine grained sand with little silt and little clay	20 to 30 feet, 10 feet recovery	
25	-25	SILTY-SAND (SP-SM) brown, moist, loose very fine to coarse-grained sand most fine with trace silt		
30	-30	GRAVELY-SAND (SW-SM) dark brown, wet, loose fine to coarse grained sand mostly medium (30-40%) and coarse(15-25%) with few fine to coarse subangular to subrounded gravel. Gravel mostly fine (5-10%)	30 to 40 feet, 10 feet recovery	
		SILTY-SAND (SM) gray, moist, very fine to fine-grained sand mostly very fine with few silt		
35	-35	SILTY-GRAVELY-SAND (SW-SM) dark brown, wet, loose fine to coarse grained sand mostly fine (25-35%) and medium (15-25%)with few fine to medium subrounded gravel mostly fine (5-8%) and trace silt		

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FIELD BOREHOLE LOG

BOREHOLE NO.: **TH2023-WELL-5R**

TOTAL DEPTH: **113 feet**

DEPTH (feet)	ELEVATION (feet)	LITHOLOGY	RECOVERY	WELL CONSTRUCTION
		and medium (15-25%)with few fine to medium subrounded gravel mostly fine (5-8%) and trace silt		
		GRAVELY-SAND (SP) brown to dark brown, wet, loose fine to coarse grained sand mostly medium (25-35%), fine (20-30%) with few fine to medium scattered subrounded gravel. Gravel mostly fine (5-8%)		
40	-40	GRAVELY-SAND (SP) brown to dark brown, wet, loose fine to coarse grained sand mostly medium (25-35%), fine (20-30%) with few fine to medium scattered subrounded gravel. Gravel mostly fine (5-8%)	40 to 50 feet, 10 feet recovery	
45	-45	SILTY-SAND (SP) dark brown to light gray, wet, fine to coarse-grained sand mostly fine with trace silt		
50	-50	SILTY-GRAVELY-SAND (SP-SC) brown, wet, fine to coarse-grained sand mostly fine and medium with trace fine gravel and trace silt	50 to 60 feet, 10 feet recovery	
		CLAY (CH) dark gray, moist, stiff clay		
55	-55			
60	-60	CLAY (CH) dark gray, moist, stiff clay		
		SILTY-SAND (SM) dark gray, moist, very fine-grained sand with little silt	60 to 70 feet, 10 feet recovery	
65	-65	SILTY-SAND (SP-SM) light to dark gray, wet, very fine to fine-grained sand mostly fine with few silt		
70	-70	SILTY-SAND (SP) dark gray to orangish-brown, wet, very fine to medium-grained sand most fine with trace silt	70 to 80 feet, 10 feet recovery	
75	-75	GRAVELY-SAND (GW-GM) brown, wet, loose fine to coarse grained sand mostly (25-35%) and medium (15-25%) with little fine to coarse subrounded to well-rounded gravel mostly fine (10-15%) and coarse(5-10%). Fossilized limestone at 90 feet		

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FIELD BOREHOLE LOG

BOREHOLE NO.: **TH2023-WELL-5R**

TOTAL DEPTH: **113 feet**

DEPTH (feet)	ELEVATION (feet)	LITHOLOGY	RECOVERY	WELL CONSTRUCTION
		coarse(5-10%). Fossilized limestone at 90 feet		
80	-80		80 to 90 feet, 10 feet recovery	
85	-85			
90	-90	GRAVELY-SAND (GW-GM) brown, wet, loose fine to coarse grained sand mostly (25-35%) and medium (15-25%) with little fine to coarse subrounded to well-rounded gravel mostly fine (10-15%) and coarse(5-10%)	90 to 100 feet, 10 feet recovery	
95	-95	SILTY-GRAVELY-SAND (GM) grayish-brown, wet, loose fine to coarse-grained sand mostly coarse (20-25%)and medium (15-20%) with little fine to coarse subrounded to well-rounded gravel mostly coarse (10-15%) and fine (5-10%) and trace silt		
100	-100	SILTY-GRAVELY-SAND (GW-GM) grayish-brown, wet, fine to coarse-grained sand mostly coarse (20-30%) and medium (15-10%) with some fine to coarse subrounded to well-rounded gravel mostly medium (15-20%) and fine (10-15%) and trace silt	100 to 110 feet, 8 feet recovery	
105	-105	SAND-GRAVELY (GW) grayish-brown, wet, loose fine to coarse rounded to well-rounded gravel mostly medium (30-40%) and fine (20-25%) with little fine to coarse grained sand mostly coarse (10-15%) and medium(5-10%)		
		SILTY-GRAVELY-SAND (GW-GM) grayish-brown, wet, loose fine to coarse grained sand mostly coarse (15-25%) and fine (15-20%) with some fine to coarse rounded to well-rounded gravel mostly medium (15-20%) and coarse (10-15%) and trace few silt		
110	-110	SILTY-GRAVELY-SAND (GW-GM) grayish-brown, wet, loose fine to coarse grained sand mostly coarse (15-25%) and fine (15-20%) with some fine to coarse rounded to well-rounded gravel mostly medium (15-20%) and coarse (10-15%) and trace few silt	110 to 113 feet, 3 feet recovery	
		WEATHERED BEDROCK SHALE, gray, moist		
		COMPETENT BEDROCK SHALE, gray, moist		

TH2023-WELL-5R KCMO Borehole Materials - Kansas City, Missouri



6 - 10 feet



14 - 17 feet



17 - 20 feet



22 - 26 feet

TH2023-WELL-5R KCMO Borehole Materials - Kansas City, Missouri



26 - 28 feet



28 -30 feet



31 - 35 feet



35 - 38 feet

TH2023-WELL-5R KCMO Borehole Materials - Kansas City, Missouri



38 - 40 feet



43 - 46 feet



46 - 50 feet



50 - 53 feet

TH2023-WELL-5R KCMO Borehole Materials - Kansas City, Missouri



53 - 56 feet



56 - 60 feet



61 - 64 feet



64 - 67 feet

TH2023-WELL-5R KCMO Borehole Materials - Kansas City, Missouri



67 - 70 feet



72 - 75 feet



75 - 78 feet



78 - 80 feet

TH2023-WELL-5R KCMO Borehole Materials - Kansas City, Missouri



82 - 85 feet



85 - 88 feet



88 - 90 feet



90 - 93 feet

TH2023-WELL-5R KCMO Borehole Materials - Kansas City, Missouri



93 - 96 feet



96 - 100 feet



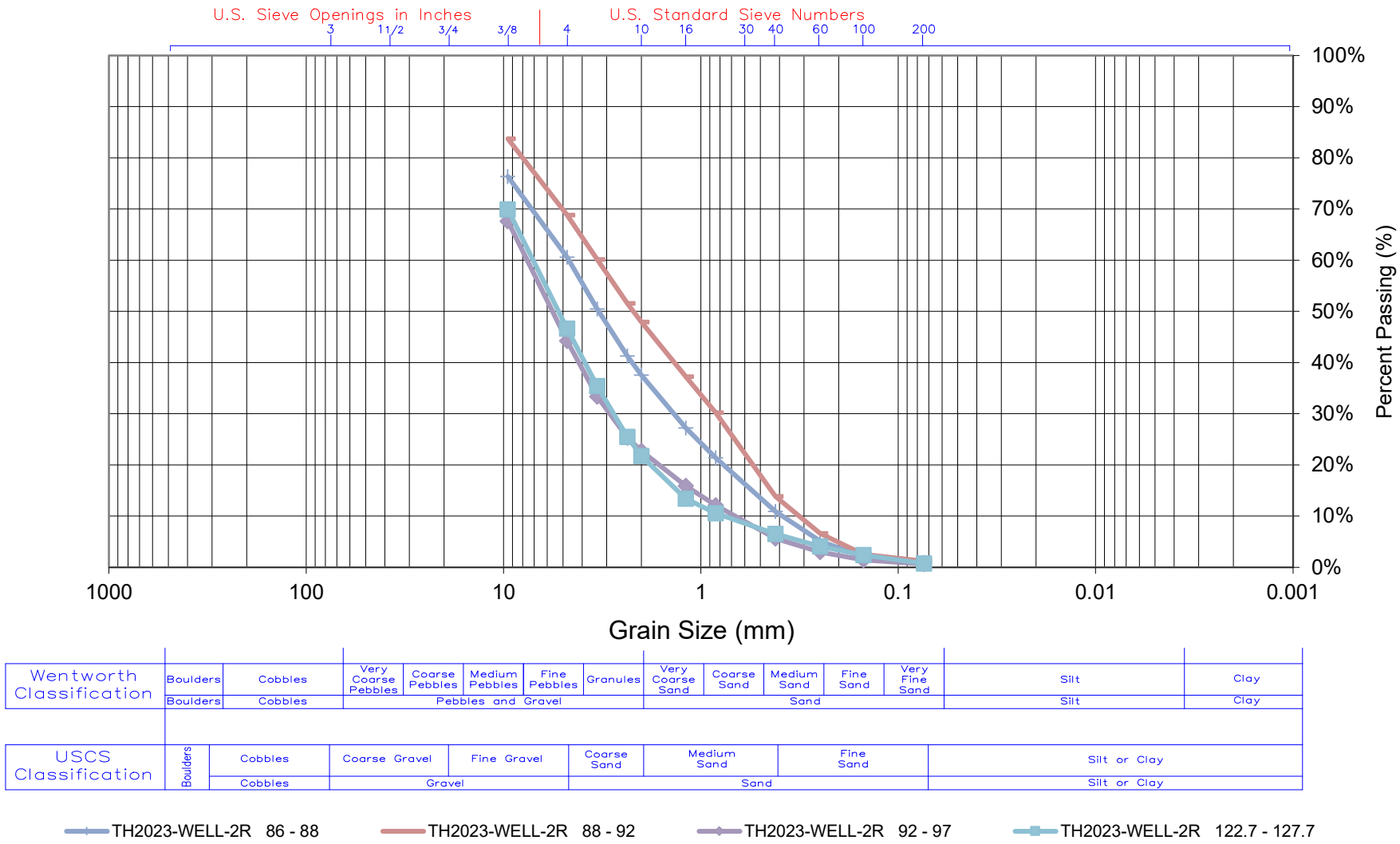
104 - 107 feet



107 - 110 feet



110 - 113 feet

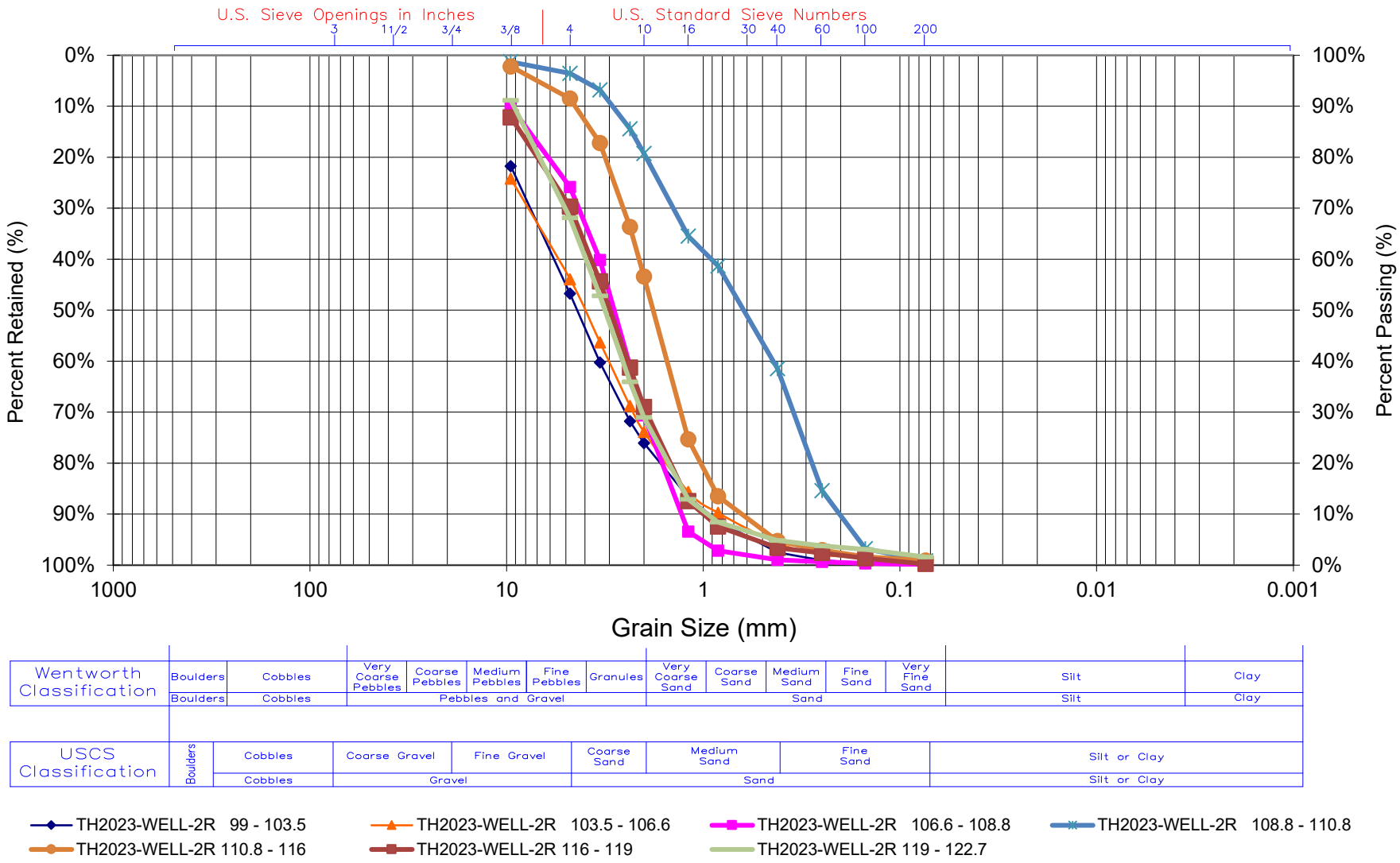


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GRAIN SIZE ANALYSIS

Layne - Ranney Collector Wells

Project:	Kansas City, Missouri/Black and Veatch Corporation
Boring ID:	TH2023-WELL-2R
Job Number:	1055052



Layne
A GRANITE COMPANY

GRAIN SIZE ANALYSIS

Layne - Ranney Collector Wells

Project: Kansas City, Missouri/Black and Veatch Corporation

Boring ID: TH2023-WELL-2R

Job Number: 1055052

SIEVE ANALYSIS RESULTS

Client: Kansas City, Missouri/Black and Veatch Corporation
Job No. 1055052

Boring ID: TH2023-WELL-2R
Depth Interval: 86 - 88

Sieve Size or Sieve No.	Sieve Size (mm)	Sieve Size (inches)	Weight Retained (grams)	Cumulative Weight (grams)	Cumulative % Retained	Cumulative % Passing
3/8	9.525	0.375	477	477	23.6%	76.4%
4	4.760	0.187	318	795	39.4%	60.6%
6	3.353	0.132	205	1000	49.6%	50.4%
8	2.360	0.094	185	1185	58.7%	41.3%
10	1.999	0.079	75	1260	62.4%	37.6%
16	1.191	0.047	209	1469	72.8%	27.2%
20	0.841	0.033	118	1587	78.6%	21.4%
40	0.419	0.017	211	1798	89.1%	10.9%
60	0.249	0.010	117	1915	94.9%	5.1%
100	0.150	0.006	62	1977	98.0%	2.0%
200	0.074	0.003	22	1999	99.1%	0.9%
Pan			19	2018	100.0%	0.0%

Total	2018			
Initial Weight	2028	Gravel	Sand	Silt or Clay
Difference	0.5%	62.4%	36.6%	0.9%

	D_{10}	D_{40}	D_{50}	D_{60}	D_{90}	C_u
(mm)	0.386	2.229	3.296	4.662	> 5	12.06
(inches)	0.015	0.088	0.130	0.184	> 0.19	

Boring ID: TH2023-WELL-2R
Depth Interval: 88 - 92

Sieve Size or Sieve No.	Sieve Size (mm)	Sieve Size (inches)	Weight Retained (grams)	Cumulative Weight (grams)	Cumulative % Retained	Cumulative % Passing
3/8	9.525	0.375	283	283	16.3%	83.7%
4	4.760	0.187	260	543	31.2%	68.8%
6	3.353	0.132	151	694	39.9%	60.1%
8	2.360	0.094	149	843	48.4%	51.6%
10	1.999	0.079	63	906	52.1%	47.9%
16	1.191	0.047	186	1092	62.8%	37.2%
20	0.841	0.033	122	1214	69.8%	30.2%
40	0.419	0.017	285	1499	86.1%	13.9%
60	0.249	0.010	126	1625	93.4%	6.6%
100	0.150	0.006	71	1696	97.5%	2.5%
200	0.074	0.003	23	1719	98.8%	1.2%
Pan			21	1740	100.0%	0.0%

Total	1740			
Initial Weight	1746	Gravel	Sand	Silt or Clay
Difference	0.3%	52.1%	46.7%	1.2%

	D_{10}	D_{40}	D_{50}	D_{60}	D_{90}	C_u
(mm)	0.318	1.361	2.198	3.337	> 4	10.50
(inches)	0.013	0.054	0.087	0.131	> 0.14	

SIEVE ANALYSIS RESULTS

Client: Kansas City, Missouri/Black and Veatch Corporation
Job No. 1055052

Boring ID: TH2023-WELL-2R
Depth Interval: 92 - 97

Sieve Size or Sieve No.	Sieve Size (mm)	Sieve Size (inches)	Weight Retained (grams)	Cumulative Weight (grams)	Cumulative % Retained	Cumulative % Passing
3/8	9.525	0.375	603	603	32.4%	67.6%
4	4.760	0.187	436	1039	55.8%	44.2%
6	3.353	0.132	202	1241	66.6%	33.4%
8	2.360	0.094	150	1391	74.7%	25.3%
10	1.999	0.079	48	1439	77.3%	22.7%
16	1.191	0.047	127	1566	84.1%	15.9%
20	0.841	0.033	71	1637	87.9%	12.1%
40	0.419	0.017	120	1757	94.4%	5.6%
60	0.249	0.010	50	1807	97.0%	3.0%
100	0.150	0.006	28	1835	98.5%	1.5%
200	0.074	0.003	15	1850	99.4%	0.6%
Pan			12	1862	100.0%	0.0%

Total	1862			
Initial Weight	1865	Gravel	Sand	Silt or Clay
Difference	0.2%	77.3%	22.1%	0.6%

	D_{10}	D_{40}	D_{50}	D_{60}	D_{90}	C_u
(mm)	0.671	4.156	5.652	7.601	> 8	11.32
(inches)	0.026	0.164	0.223	0.299	> 0.3	

Boring ID: TH2023-WELL-2R
Depth Interval: 122.7 - 127.7

Sieve Size or Sieve No.	Sieve Size (mm)	Sieve Size (inches)	Weight Retained (grams)	Cumulative Weight (grams)	Cumulative % Retained	Cumulative % Passing
3/8	9.525	0.375	537	537	30.1%	69.9%
4	4.760	0.187	416	953	53.4%	46.6%
6	3.353	0.132	200	1153	64.6%	35.4%
8	2.360	0.094	177	1330	74.5%	25.5%
10	1.999	0.079	67	1397	78.3%	21.7%
16	1.191	0.047	149	1546	86.6%	13.4%
20	0.841	0.033	51	1597	89.5%	10.5%
40	0.419	0.017	72	1669	93.5%	6.5%
60	0.249	0.010	43	1712	95.9%	4.1%
100	0.150	0.006	31	1743	97.6%	2.4%
200	0.074	0.003	29	1772	99.3%	0.7%
Pan			13	1785	100.0%	0.0%

Total	1785			
Initial Weight	1790	Gravel	Sand	Silt or Clay
Difference	0.3%	78.3%	21.0%	0.7%

	D_{10}	D_{40}	D_{50}	D_{60}	D_{90}	C_u
(mm)	0.767	3.871	5.265	7.091	> 8	9.24
(inches)	0.030	0.152	0.207	0.279	> 0.28	

SIEVE ANALYSIS RESULTS

Client: Kansas City, Missouri/Black and Veatch Corporation
Job No. 1055052

Boring ID: TH2023-WELL-2R
Depth Interval: 99 - 103.5

Sieve Size or Sieve No.	Sieve Size (mm)	Sieve Size (inches)	Weight Retained (grams)	Cumulative Weight (grams)	Cumulative % Retained	Cumulative % Passing
3/8	9.525	0.375	410	410	21.8%	78.2%
4	4.760	0.187	470	880	46.7%	53.3%
6	3.353	0.132	255	1135	60.3%	39.7%
8	2.360	0.094	217	1352	71.8%	28.2%
10	1.999	0.079	81	1433	76.1%	23.9%
16	1.191	0.047	200	1633	86.7%	13.3%
20	0.841	0.033	87	1720	91.3%	8.7%
40	0.419	0.017	116	1836	97.5%	2.5%
60	0.249	0.010	30	1866	99.1%	0.9%
100	0.150	0.006	10	1876	99.6%	0.4%
200	0.074	0.003	4	1880	99.8%	0.2%
Pan			3	1883	100.0%	0.0%

Total	1883			
Initial Weight	1889	Gravel	Sand	Silt or Clay
Difference	0.3%	76.1%	23.7%	0.2%

	D_{10}	D_{40}	D_{50}	D_{60}	D_{90}	C_u
(mm)	0.931	3.377	4.374	5.740	> 6	6.17
(inches)	0.037	0.133	0.172	0.226	> 0.23	

Boring ID: TH2023-WELL-2R
Depth Interval: 103.5 - 106.6

Sieve Size or Sieve No.	Sieve Size (mm)	Sieve Size (inches)	Weight Retained (grams)	Cumulative Weight (grams)	Cumulative % Retained	Cumulative % Passing
3/8	9.525	0.375	388	388	24.2%	75.8%
4	4.760	0.187	316	704	43.9%	56.1%
6	3.353	0.132	198	902	56.3%	43.7%
8	2.360	0.094	200	1102	68.8%	31.2%
10	1.999	0.079	82	1184	73.9%	26.1%
16	1.191	0.047	188	1372	85.6%	14.4%
20	0.841	0.033	66	1438	89.8%	10.2%
40	0.419	0.017	95	1533	95.7%	4.3%
60	0.249	0.010	36	1569	97.9%	2.1%
100	0.150	0.006	9	1578	98.5%	1.5%
200	0.074	0.003	18	1596	99.6%	0.4%
Pan			6	1602	100.0%	0.0%

Total	1602			
Initial Weight	1612	Gravel	Sand	Silt or Clay
Difference	0.6%	73.9%	25.7%	0.4%

	D_{10}	D_{40}	D_{50}	D_{60}	D_{90}	C_u
(mm)	0.818	3.022	4.009	5.468	> 6	6.69
(inches)	0.032	0.119	0.158	0.215	> 0.22	

SIEVE ANALYSIS RESULTS

Client: Kansas City, Missouri/Black and Veatch Corporation
Job No. 1055052

Boring ID: TH2023-WELL-2R
Depth Interval: 106.6 - 108.8

Sieve Size or Sieve No.	Sieve Size (mm)	Sieve Size (inches)	Weight Retained (grams)	Cumulative Weight (grams)	Cumulative % Retained	Cumulative % Passing
3/8	9.525	0.375	177	177	10.1%	89.9%
4	4.760	0.187	277	454	25.8%	74.2%
6	3.353	0.132	252	706	40.2%	59.8%
8	2.360	0.094	365	1071	61.0%	39.0%
10	1.999	0.079	170	1241	70.6%	29.4%
16	1.191	0.047	401	1642	93.5%	6.5%
20	0.841	0.033	65	1707	97.2%	2.8%
40	0.419	0.017	32	1739	99.0%	1.0%
60	0.249	0.010	7	1746	99.4%	0.6%
100	0.150	0.006	5	1751	99.7%	0.3%
200	0.074	0.003	4	1755	99.9%	0.1%
Pan			2	1757	100.0%	0.0%

Total	1757			
Initial Weight	1764	Gravel	Sand	Silt or Clay
Difference	0.4%	70.6%	29.3%	0.1%

	D_{10}	D_{40}	D_{50}	D_{60}	D_{90}	C_u
(mm)	1.288	2.398	2.840	3.368	> 4	2.61
(inches)	0.051	0.094	0.112	0.133	> 0.14	

Boring ID: TH2023-WELL-2R
Depth Interval: 108.8 - 110.8

Sieve Size or Sieve No.	Sieve Size (mm)	Sieve Size (inches)	Weight Retained (grams)	Cumulative Weight (grams)	Cumulative % Retained	Cumulative % Passing
3/8	9.525	0.375	20	20	1.3%	98.7%
4	4.760	0.187	36	56	3.5%	96.5%
6	3.353	0.132	51	107	6.8%	93.2%
8	2.360	0.094	121	228	14.4%	85.6%
10	1.999	0.079	76	304	19.3%	80.7%
16	1.191	0.047	256	560	35.5%	64.5%
20	0.841	0.033	92	652	41.3%	58.7%
40	0.419	0.017	318	970	61.5%	38.5%
60	0.249	0.010	378	1348	85.4%	14.6%
100	0.150	0.006	179	1527	96.8%	3.2%
200	0.074	0.003	38	1565	99.2%	0.8%
Pan			13	1578	100.0%	0.0%

Total	1578			
Initial Weight	1587	Gravel	Sand	Silt or Clay
Difference	0.6%	19.3%	79.9%	0.8%

	D_{10}	D_{40}	D_{50}	D_{60}	D_{90}	C_u
(mm)	0.203	0.441	0.623	0.910	2.89	4.48
(inches)	0.008	0.017	0.025	0.036	0.114	

SIEVE ANALYSIS RESULTS

Client: Kansas City, Missouri/Black and Veatch Corporation
Job No. 1055052

Boring ID: TH2023-WELL-2R
Depth Interval: 110.8 - 116

Sieve Size or Sieve No.	Sieve Size (mm)	Sieve Size (inches)	Weight Retained (grams)	Cumulative Weight (grams)	Cumulative % Retained	Cumulative % Passing
3/8	9.525	0.375	39	39	2.2%	97.8%
4	4.760	0.187	112	151	8.5%	91.5%
6	3.353	0.132	154	305	17.2%	82.8%
8	2.360	0.094	292	597	33.7%	66.3%
10	1.999	0.079	173	770	43.4%	56.6%
16	1.191	0.047	566	1336	75.4%	24.6%
20	0.841	0.033	198	1534	86.5%	13.5%
40	0.419	0.017	155	1689	95.3%	4.7%
60	0.249	0.010	32	1721	97.1%	2.9%
100	0.150	0.006	23	1744	98.4%	1.6%
200	0.074	0.003	13	1757	99.1%	0.9%
Pan			16	1773	100.0%	0.0%

Total	1773			
Initial Weight	1778	Gravel	Sand	Silt or Clay
Difference	0.3%	43.4%	55.7%	0.9%

	D_{10}	D_{40}	D_{50}	D_{60}	D_{90}	C_u
(mm)	0.637	1.528	1.797	2.119	4.48	3.33
(inches)	0.025	0.060	0.071	0.083	0.177	

Boring ID: TH2023-WELL-2R
Depth Interval: 116 - 119

Sieve Size or Sieve No.	Sieve Size (mm)	Sieve Size (inches)	Weight Retained (grams)	Cumulative Weight (grams)	Cumulative % Retained	Cumulative % Passing
3/8	9.525	0.375	227	227	12.2%	87.8%
4	4.760	0.187	326	553	29.7%	70.3%
6	3.353	0.132	273	826	44.3%	55.7%
8	2.360	0.094	315	1141	61.2%	38.8%
10	1.999	0.079	144	1285	69.0%	31.0%
16	1.191	0.047	344	1629	87.4%	12.6%
20	0.841	0.033	93	1722	92.4%	7.6%
40	0.419	0.017	78	1800	96.6%	3.4%
60	0.249	0.010	19	1819	97.6%	2.4%
100	0.150	0.006	19	1838	98.7%	1.3%
200	0.074	0.003	21	1859	99.8%	0.2%
Pan			4	1863	100.0%	0.0%

Total	1863			
Initial Weight	1872	Gravel	Sand	Silt or Clay
Difference	0.5%	69.0%	30.8%	0.2%

	D_{10}	D_{40}	D_{50}	D_{60}	D_{90}	C_u
(mm)	0.996	2.422	2.981	3.719	> 4	3.73
(inches)	0.039	0.095	0.117	0.146	> 0.15	

SIEVE ANALYSIS RESULTS

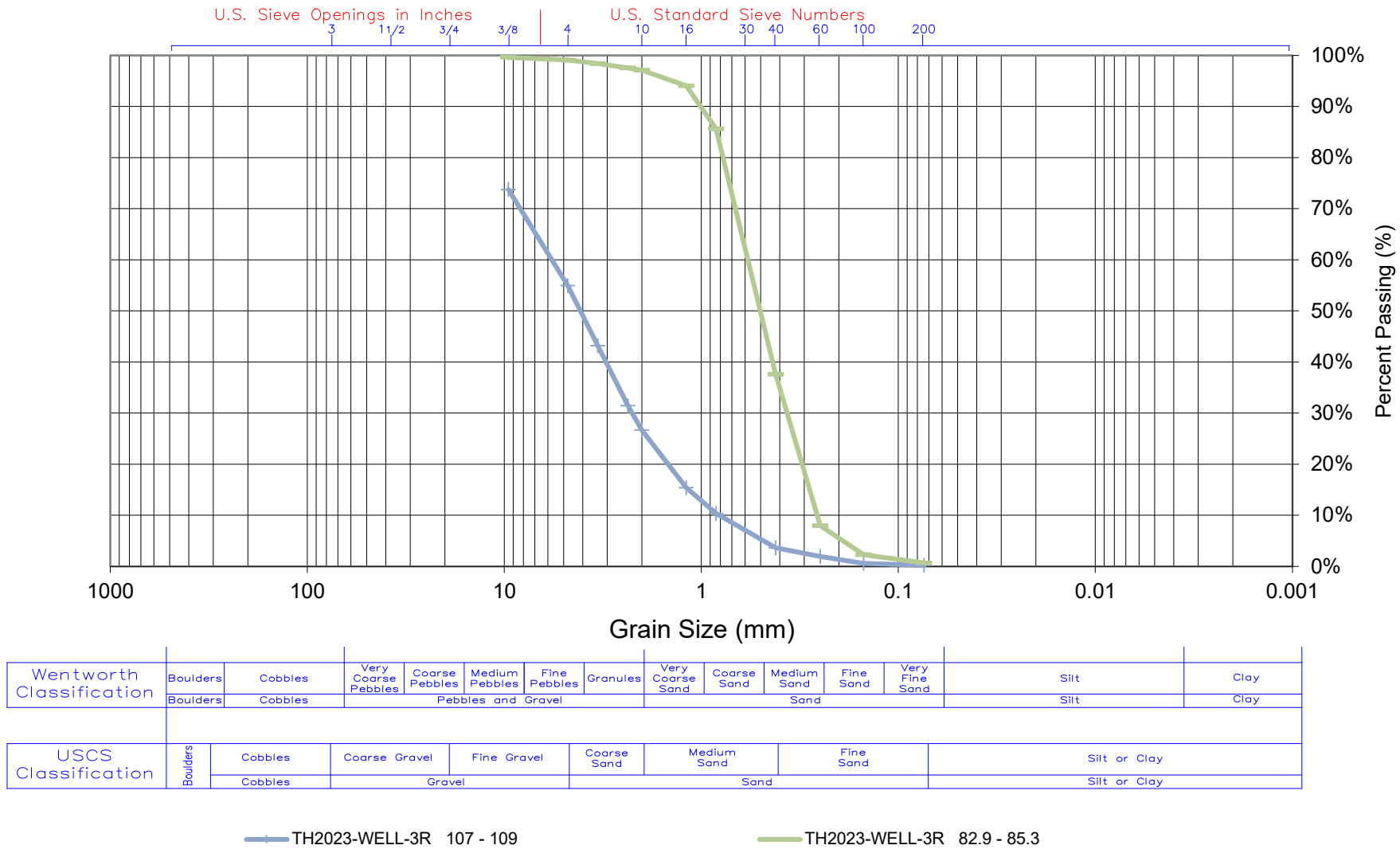
Client: Kansas City, Missouri/Black and Veatch Corporation
Job No. 1055052

Boring ID: TH2023-WELL-2R
Depth Interval: 119 - 122.7

Sieve Size or Sieve No.	Sieve Size (mm)	Sieve Size (inches)	Weight Retained (grams)	Cumulative Weight (grams)	Cumulative % Retained	Cumulative % Passing
3/8	9.525	0.375	171	171	8.8%	91.2%
4	4.760	0.187	447	618	31.9%	68.1%
6	3.353	0.132	297	915	47.2%	52.8%
8	2.360	0.094	326	1241	64.0%	36.0%
10	1.999	0.079	136	1377	71.1%	28.9%
16	1.191	0.047	311	1688	87.1%	12.9%
20	0.841	0.033	87	1775	91.6%	8.4%
40	0.419	0.017	70	1845	95.2%	4.8%
60	0.249	0.010	20	1865	96.2%	3.8%
100	0.150	0.006	13	1878	96.9%	3.1%
200	0.074	0.003	29	1907	98.4%	1.6%
Pan			31	1938	100.0%	0.0%

Total	1938			
Initial Weight	1945	Gravel	Sand	Silt or Clay
Difference	0.4%	71.1%	27.3%	1.6%

	D_{10}	D_{40}	D_{50}	D_{60}	D_{90}	C_u
(mm)	0.951	2.567	3.164	3.954	9.19	4.16
(inches)	0.037	0.101	0.125	0.156	0.362	

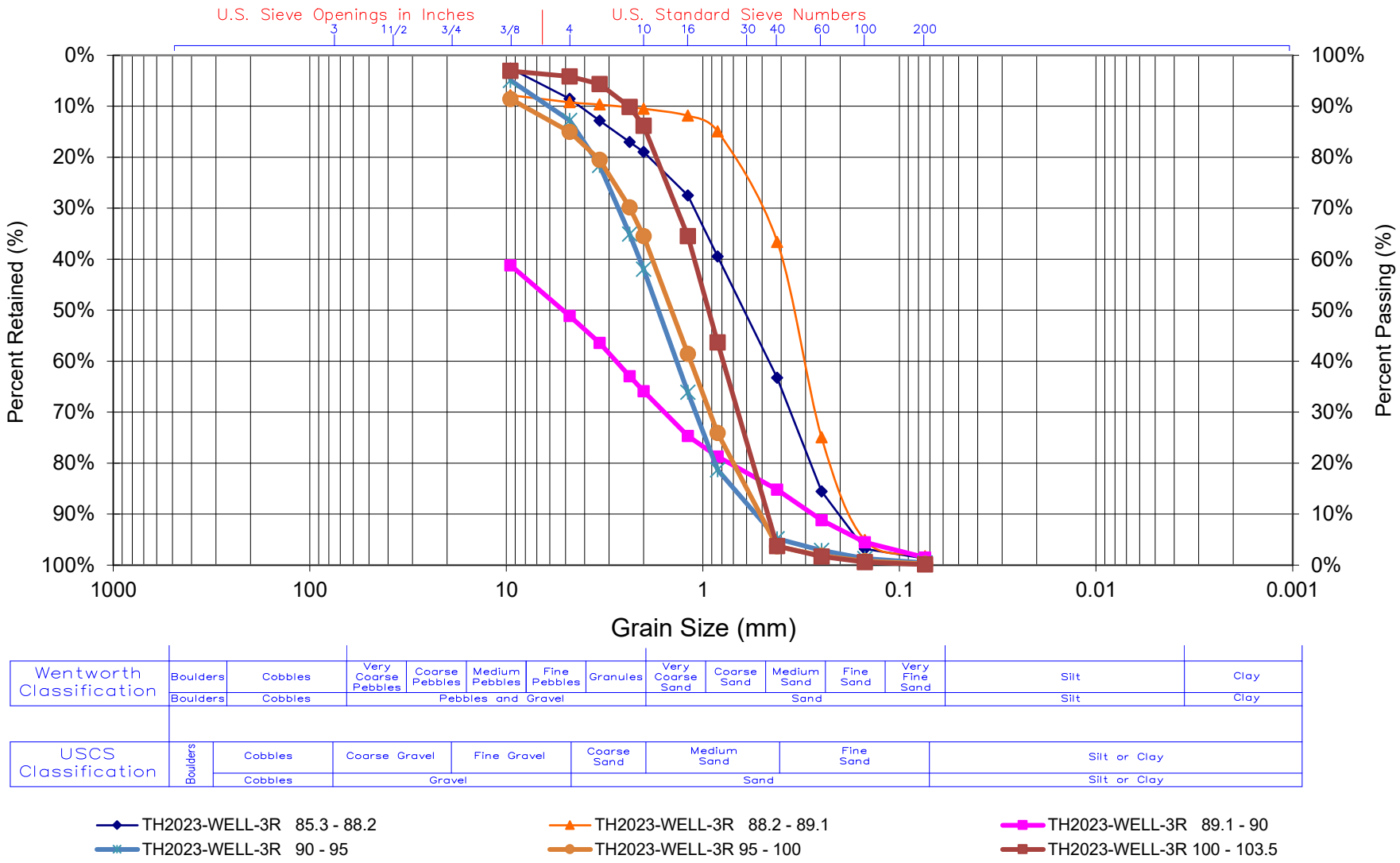


Layne
A GRANITE COMPANY

GRAIN SIZE ANALYSIS

Layne - Ranney Collector Wells

Project:	Kansas City, Missouri/Black and Veatch Corporation
Boring ID:	TH2023-WELL-3R
Job Number:	1055052



GRAIN SIZE ANALYSIS

Layne - Ranney Collector Wells

Project: Kansas City, Missouri/Black and Veatch Corporation

Boring ID: TH2023-WELL-3R

Job Number: 1055052

SIEVE ANALYSIS RESULTS

Client: Kansas City, Missouri/Black and Veatch Corporation
Job No. 1055052

Boring ID: TH2023-WELL-3R
Depth Interval: 82.9 - 85.3

Sieve Size or Sieve No.	Sieve Size (mm)	Sieve Size (inches)	Weight Retained (grams)	Cumulative Weight (grams)	Cumulative % Retained	Cumulative % Passing
3/8	9.525	0.375	5	5	0.4%	99.6%
4	4.760	0.187	7	12	0.9%	99.1%
6	3.353	0.132	9	21	1.6%	98.4%
8	2.360	0.094	11	32	2.4%	97.6%
10	1.999	0.079	6	38	2.9%	97.1%
16	1.191	0.047	40	78	6.0%	94.0%
20	0.841	0.033	110	188	14.4%	85.6%
40	0.419	0.017	628	816	62.4%	37.6%
60	0.249	0.010	387	1203	92.0%	8.0%
100	0.150	0.006	74	1277	97.7%	2.3%
200	0.074	0.003	21	1298	99.3%	0.7%
Pan			9	1307	100.0%	0.0%

Total	1307			
Initial Weight	1312	Gravel	Sand	Silt or Clay
Difference	0.4%	2.9%	96.4%	0.7%

	D_{10}	D_{40}	D_{50}	D_{60}	D_{90}	C_u
(mm)	0.258	0.434	0.502	0.580	1.01	2.25
(inches)	0.010	0.017	0.020	0.023	0.040	

Boring ID: TH2023-WELL-3R
Depth Interval: 107 - 109

Sieve Size or Sieve No.	Sieve Size (mm)	Sieve Size (inches)	Weight Retained (grams)	Cumulative Weight (grams)	Cumulative % Retained	Cumulative % Passing
3/8	9.525	0.375	511	511	26.3%	73.7%
4	4.760	0.187	365	876	45.0%	55.0%
6	3.353	0.132	229	1105	56.8%	43.2%
8	2.360	0.094	228	1333	68.5%	31.5%
10	1.999	0.079	93	1426	73.3%	26.7%
16	1.191	0.047	220	1646	84.6%	15.4%
20	0.841	0.033	98	1744	89.7%	10.3%
40	0.419	0.017	131	1875	96.4%	3.6%
60	0.249	0.010	33	1908	98.1%	1.9%
100	0.150	0.006	26	1934	99.4%	0.6%
200	0.074	0.003	7	1941	99.8%	0.2%
Pan			4	1945	100.0%	0.0%

Total	1945			
Initial Weight	1952	Gravel	Sand	Silt or Clay
Difference	0.4%	73.3%	26.5%	0.2%

	D_{10}	D_{40}	D_{50}	D_{60}	D_{90}	C_u
(mm)	0.812	3.048	4.107	5.734	> 6	7.06
(inches)	0.032	0.120	0.162	0.226	> 0.23	

SIEVE ANALYSIS RESULTS

Client: Kansas City, Missouri/Black and Veatch Corporation
Job No. 1055052

Boring ID: TH2023-WELL-3R
Depth Interval: 85.3 - 88.2

Sieve Size or Sieve No.	Sieve Size (mm)	Sieve Size (inches)	Weight Retained (grams)	Cumulative Weight (grams)	Cumulative % Retained	Cumulative % Passing
3/8	9.525	0.375	36	36	2.6%	97.4%
4	4.760	0.187	83	119	8.5%	91.5%
6	3.353	0.132	60	179	12.8%	87.2%
8	2.360	0.094	58	237	17.0%	83.0%
10	1.999	0.079	27	264	19.0%	81.0%
16	1.191	0.047	119	383	27.5%	72.5%
20	0.841	0.033	167	550	39.5%	60.5%
40	0.419	0.017	331	881	63.2%	36.8%
60	0.249	0.010	311	1192	85.6%	14.4%
100	0.150	0.006	157	1349	96.8%	3.2%
200	0.074	0.003	26	1375	98.7%	1.3%
Pan			18	1393	100.0%	0.0%

Total	1393			
Initial Weight	1399	Gravel	Sand	Silt or Clay
Difference	0.4%	19.0%	79.8%	1.3%

	D_{10}	D_{40}	D_{50}	D_{60}	D_{90}	C_u
(mm)	0.204	0.461	0.618	0.828	4.23	4.06
(inches)	0.008	0.018	0.024	0.033	0.166	

Boring ID: TH2023-WELL-3R
Depth Interval: 88.2 - 89.1

Sieve Size or Sieve No.	Sieve Size (mm)	Sieve Size (inches)	Weight Retained (grams)	Cumulative Weight (grams)	Cumulative % Retained	Cumulative % Passing
3/8	9.525	0.375	86	86	7.8%	92.2%
4	4.760	0.187	15	101	9.2%	90.8%
6	3.353	0.132	5	106	9.7%	90.3%
8	2.360	0.094	6	112	10.2%	89.8%
10	1.999	0.079	3	115	10.5%	89.5%
16	1.191	0.047	15	130	11.8%	88.2%
20	0.841	0.033	34	164	14.9%	85.1%
40	0.419	0.017	238	402	36.6%	63.4%
60	0.249	0.010	421	823	75.0%	25.0%
100	0.150	0.006	221	1044	95.1%	4.9%
200	0.074	0.003	35	1079	98.3%	1.7%
Pan			19	1098	100.0%	0.0%

Total	1098			
Initial Weight	1103	Gravel	Sand	Silt or Clay
Difference	0.5%	10.5%	87.8%	1.7%

	D_{10}	D_{40}	D_{50}	D_{60}	D_{90}	C_u
(mm)	0.170	0.305	0.349	0.400	2.68	2.35
(inches)	0.007	0.012	0.014	0.016	0.106	

SIEVE ANALYSIS RESULTS

Client: Kansas City, Missouri/Black and Veatch Corporation
Job No. 1055052

Boring ID: TH2023-WELL-3R
Depth Interval: 89.1 - 90

Sieve Size or Sieve No.	Sieve Size (mm)	Sieve Size (inches)	Weight Retained (grams)	Cumulative Weight (grams)	Cumulative % Retained	Cumulative % Passing
3/8	9.525	0.375	750	750	41.2%	58.8%
4	4.760	0.187	181	931	51.2%	48.8%
6	3.353	0.132	96	1027	56.4%	43.6%
8	2.360	0.094	119	1146	63.0%	37.0%
10	1.999	0.079	53	1199	65.9%	34.1%
16	1.191	0.047	160	1359	74.7%	25.3%
20	0.841	0.033	74	1433	78.7%	21.3%
40	0.419	0.017	118	1551	85.2%	14.8%
60	0.249	0.010	109	1660	91.2%	8.8%
100	0.150	0.006	79	1739	95.5%	4.5%
200	0.074	0.003	54	1793	98.5%	1.5%
Pan			27	1820	100.0%	0.0%

Total	1820			
Initial Weight	1828	Gravel	Sand	Silt or Clay
Difference	0.4%	65.9%	32.6%	1.5%

	D_{10}	D_{40}	D_{50}	D_{60}	D_{90}	C_u
(mm)	0.277	2.768	5.159	9.653	> 10	34.90
(inches)	0.011	0.109	0.203	0.380	> 0.39	

Boring ID: TH2023-WELL-3R
Depth Interval: 90 - 95

Sieve Size or Sieve No.	Sieve Size (mm)	Sieve Size (inches)	Weight Retained (grams)	Cumulative Weight (grams)	Cumulative % Retained	Cumulative % Passing
3/8	9.525	0.375	89	89	4.9%	95.1%
4	4.760	0.187	141	230	12.8%	87.2%
6	3.353	0.132	159	389	21.6%	78.4%
8	2.360	0.094	242	631	35.1%	64.9%
10	1.999	0.079	124	755	41.9%	58.1%
16	1.191	0.047	435	1190	66.1%	33.9%
20	0.841	0.033	274	1464	81.3%	18.7%
40	0.419	0.017	243	1707	94.8%	5.2%
60	0.249	0.010	41	1748	97.1%	2.9%
100	0.150	0.006	29	1777	98.7%	1.3%
200	0.074	0.003	15	1792	99.6%	0.4%
Pan			8	1800	100.0%	0.0%

Total	1800			
Initial Weight	1808	Gravel	Sand	Silt or Clay
Difference	0.4%	41.9%	57.6%	0.4%

	D_{10}	D_{40}	D_{50}	D_{60}	D_{90}	C_u
(mm)	0.538	1.358	1.682	2.095	6.09	3.90
(inches)	0.021	0.053	0.066	0.082	0.240	

SIEVE ANALYSIS RESULTS

Client: Kansas City, Missouri/Black and Veatch Corporation
Job No. 1055052

Boring ID: TH2023-WELL-3R
Depth Interval: 95 - 100

Sieve Size or Sieve No.	Sieve Size (mm)	Sieve Size (inches)	Weight Retained (grams)	Cumulative Weight (grams)	Cumulative % Retained	Cumulative % Passing
3/8	9.525	0.375	136	136	8.6%	91.4%
4	4.760	0.187	102	238	15.0%	85.0%
6	3.353	0.132	87	325	20.5%	79.5%
8	2.360	0.094	148	473	29.8%	70.2%
10	1.999	0.079	90	563	35.5%	64.5%
16	1.191	0.047	366	929	58.6%	41.4%
20	0.841	0.033	246	1175	74.1%	25.9%
40	0.419	0.017	353	1528	96.3%	3.7%
60	0.249	0.010	29	1557	98.2%	1.8%
100	0.150	0.006	17	1574	99.2%	0.8%
200	0.074	0.003	8	1582	99.7%	0.3%
Pan			4	1586	100.0%	0.0%

Total	1586			
Initial Weight	1591	Gravel	Sand	Silt or Clay
Difference	0.3%	35.5%	64.2%	0.3%

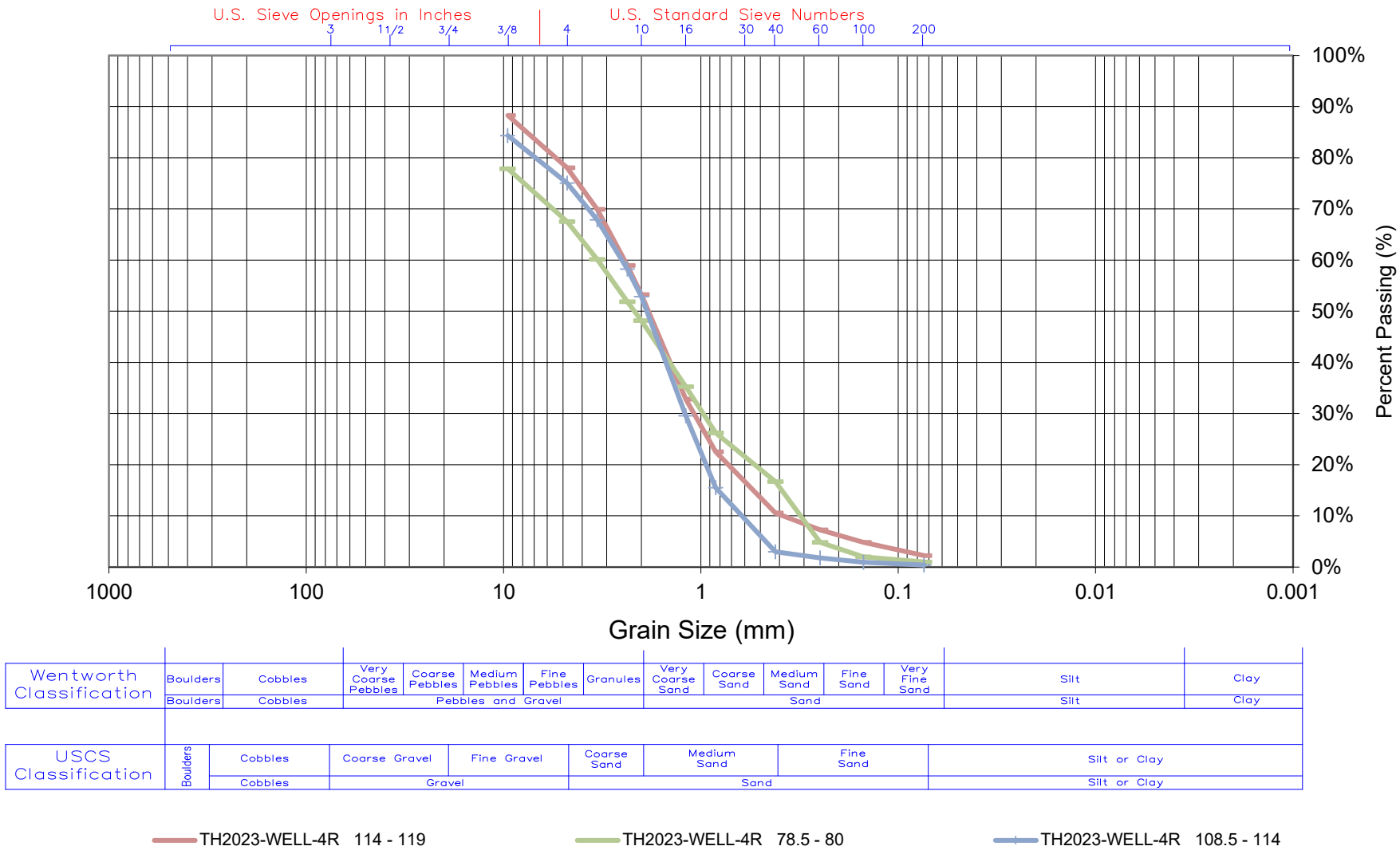
	D_{10}	D_{40}	D_{50}	D_{60}	D_{90}	C_u
(mm)	0.511	1.154	1.444	1.807	8.17	3.54
(inches)	0.020	0.045	0.057	0.071	0.322	

Boring ID: TH2023-WELL-3R
Depth Interval: 100 - 103.5

Sieve Size or Sieve No.	Sieve Size (mm)	Sieve Size (inches)	Weight Retained (grams)	Cumulative Weight (grams)	Cumulative % Retained	Cumulative % Passing
3/8	9.525	0.375	48	48	3.1%	96.9%
4	4.760	0.187	17	65	4.1%	95.9%
6	3.353	0.132	24	89	5.7%	94.3%
8	2.360	0.094	70	159	10.1%	89.9%
10	1.999	0.079	58	217	13.8%	86.2%
16	1.191	0.047	339	556	35.5%	64.5%
20	0.841	0.033	327	883	56.3%	43.7%
40	0.419	0.017	627	1510	96.3%	3.7%
60	0.249	0.010	32	1542	98.3%	1.7%
100	0.150	0.006	17	1559	99.4%	0.6%
200	0.074	0.003	7	1566	99.9%	0.1%
Pan			2	1568	100.0%	0.0%

Total	1568			
Initial Weight	1576	Gravel	Sand	Silt or Clay
Difference	0.5%	13.8%	86.0%	0.1%

	D_{10}	D_{40}	D_{50}	D_{60}	D_{90}	C_u
(mm)	0.468	0.789	0.934	1.104	2.39	2.36
(inches)	0.018	0.031	0.037	0.043	0.094	

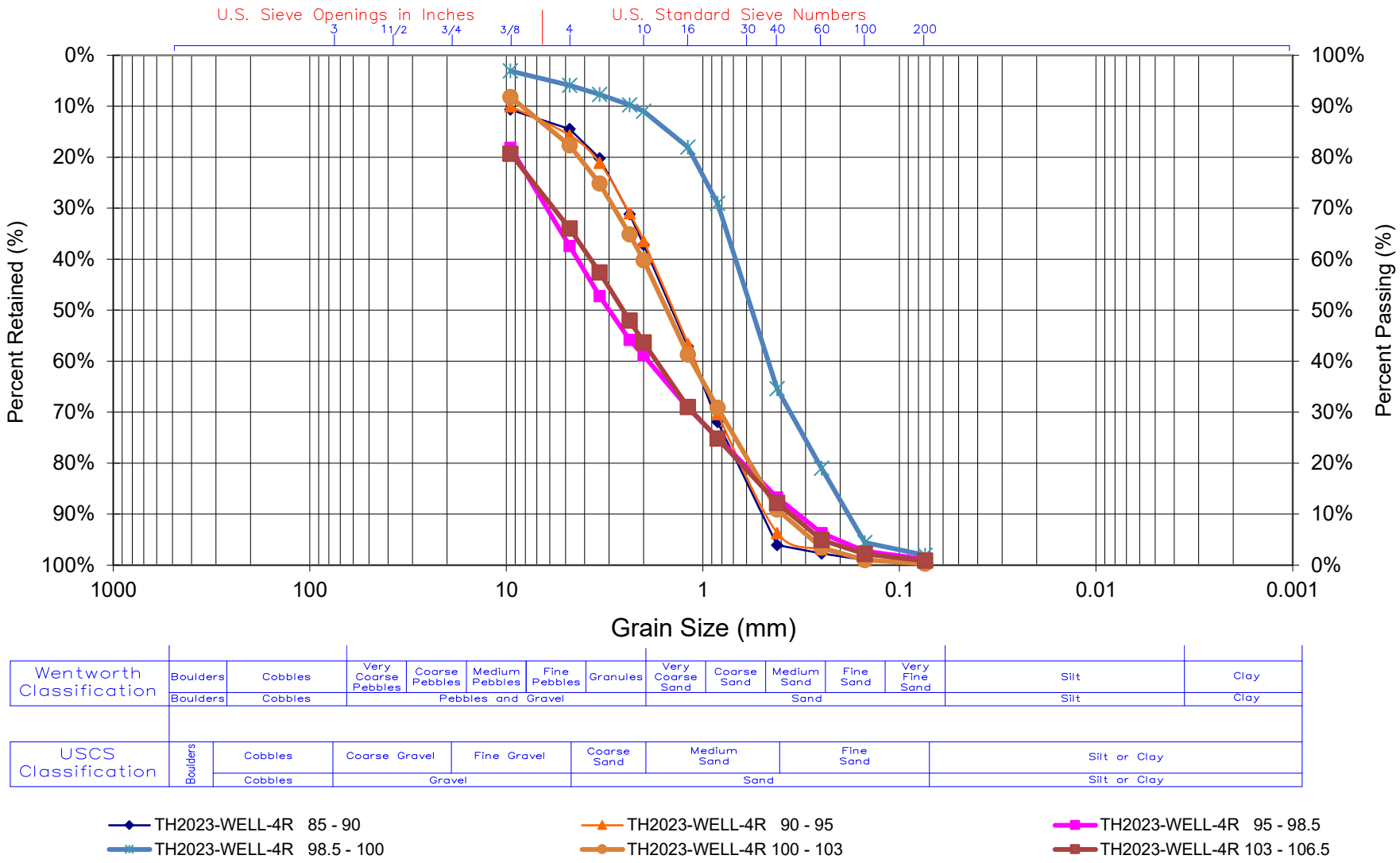


Layne
A GRANITE COMPANY

GRAIN SIZE ANALYSIS

Layne - Ranney Collector Wells

Project: Kansas City, Missouri/Black and Veatch Corporation
Boring ID: TH2023-WELL-4R
Job Number: 1055052



GRAIN SIZE ANALYSIS

Layne - Ranney Collector Wells

Project: Kansas City, Missouri/Black and Veatch Corporation

Boring ID: TH2023-WELL-4R

Job Number: 1055052

SIEVE ANALYSIS RESULTS

Client: Kansas City, Missouri/Black and Veatch Corporation
Job No. 1055052

Boring ID: TH2023-WELL-4R
Depth Interval: 78.5 - 80

Sieve Size or Sieve No.	Sieve Size (mm)	Sieve Size (inches)	Weight Retained (grams)	Cumulative Weight (grams)	Cumulative % Retained	Cumulative % Passing
3/8	9.525	0.375	378	378	22.2%	77.8%
4	4.760	0.187	176	554	32.5%	67.5%
6	3.353	0.132	126	680	39.9%	60.1%
8	2.360	0.094	141	821	48.1%	51.9%
10	1.999	0.079	63	884	51.8%	48.2%
16	1.191	0.047	221	1105	64.8%	35.2%
20	0.841	0.033	154	1259	73.8%	26.2%
40	0.419	0.017	162	1421	83.3%	16.7%
60	0.249	0.010	203	1624	95.2%	4.8%
100	0.150	0.006	48	1672	98.0%	2.0%
200	0.074	0.003	17	1689	99.0%	1.0%
Pan			17	1706	100.0%	0.0%

Total	1706			
Initial Weight	1707	Gravel	Sand	Silt or Clay
Difference	0.1%	51.8%	47.2%	1.0%

	D_{10}	D_{40}	D_{50}	D_{60}	D_{90}	C_u
(mm)	0.312	1.441	2.169	3.333	> 4	10.67
(inches)	0.012	0.057	0.085	0.131	> 0.14	

Boring ID: TH2023-WELL-4R
Depth Interval: 108.5 - 114

Sieve Size or Sieve No.	Sieve Size (mm)	Sieve Size (inches)	Weight Retained (grams)	Cumulative Weight (grams)	Cumulative % Retained	Cumulative % Passing
3/8	9.525	0.375	281	281	15.7%	84.3%
4	4.760	0.187	166	447	24.9%	75.1%
6	3.353	0.132	129	576	32.1%	67.9%
8	2.360	0.094	173	749	41.8%	58.2%
10	1.999	0.079	96	845	47.1%	52.9%
16	1.191	0.047	418	1263	70.4%	29.6%
20	0.841	0.033	252	1515	84.5%	15.5%
40	0.419	0.017	225	1740	97.0%	3.0%
60	0.249	0.010	21	1761	98.2%	1.8%
100	0.150	0.006	15	1776	99.1%	0.9%
200	0.074	0.003	10	1786	99.6%	0.4%
Pan			7	1793	100.0%	0.0%

Total	1793			
Initial Weight	1802	Gravel	Sand	Silt or Clay
Difference	0.5%	47.1%	52.5%	0.4%

	D_{10}	D_{40}	D_{50}	D_{60}	D_{90}	C_u
(mm)	0.620	1.502	1.875	2.517	> 3	4.06
(inches)	0.024	0.059	0.074	0.099	> 0.1	

SIEVE ANALYSIS RESULTS

Client: Kansas City, Missouri/Black and Veatch Corporation
Job No. 1055052

Boring ID: TH2023-WELL-4R
Depth Interval: 114 - 119

Sieve Size or Sieve No.	Sieve Size (mm)	Sieve Size (inches)	Weight Retained (grams)	Cumulative Weight (grams)	Cumulative % Retained	Cumulative % Passing
3/8	9.525	0.375	204	204	11.7%	88.3%
4	4.760	0.187	178	382	21.9%	78.1%
6	3.353	0.132	142	524	30.1%	69.9%
8	2.360	0.094	191	715	41.1%	58.9%
10	1.999	0.079	99	814	46.8%	53.2%
16	1.191	0.047	356	1170	67.2%	32.8%
20	0.841	0.033	179	1349	77.5%	22.5%
40	0.419	0.017	208	1557	89.4%	10.6%
60	0.249	0.010	58	1615	92.8%	7.2%
100	0.150	0.006	42	1657	95.2%	4.8%
200	0.074	0.003	45	1702	97.8%	2.2%
Pan			39	1741	100.0%	0.0%

Total	1741
Initial Weight	1746
Difference	0.3%

Gravel	Sand	Silt or Clay
46.8%	51.0%	2.2%

	D_{10}	D_{40}	D_{50}	D_{60}	D_{90}	C_u
(mm)	0.383	1.429	1.841	2.442	> 3	6.37
(inches)	0.015	0.056	0.072	0.096	> 0.1	

SIEVE ANALYSIS RESULTS

Client: Kansas City, Missouri/Black and Veatch Corporation
Job No. 1055052

Boring ID: TH2023-WELL-4R
Depth Interval: 85 - 90

Sieve Size or Sieve No.	Sieve Size (mm)	Sieve Size (inches)	Weight Retained (grams)	Cumulative Weight (grams)	Cumulative % Retained	Cumulative % Passing
3/8	9.525	0.375	164	164	10.7%	89.3%
4	4.760	0.187	59	223	14.5%	85.5%
6	3.353	0.132	88	311	20.2%	79.8%
8	2.360	0.094	169	480	31.2%	68.8%
10	1.999	0.079	92	572	37.2%	62.8%
16	1.191	0.047	307	879	57.1%	42.9%
20	0.841	0.033	228	1107	71.9%	28.1%
40	0.419	0.017	372	1479	96.1%	3.9%
60	0.249	0.010	25	1504	97.7%	2.3%
100	0.150	0.006	20	1524	99.0%	1.0%
200	0.074	0.003	10	1534	99.7%	0.3%
Pan			5	1539	100.0%	0.0%

Total	1539			
Initial Weight	1546	Gravel	Sand	Silt or Clay
Difference	0.5%	37.2%	62.5%	0.3%

	D_{10}	D_{40}	D_{50}	D_{60}	D_{90}	C_u
(mm)	0.500	1.113	1.433	1.857	> 2	3.72
(inches)	0.020	0.044	0.056	0.073	> 0.08	

Boring ID: TH2023-WELL-4R
Depth Interval: 90 - 95

Sieve Size or Sieve No.	Sieve Size (mm)	Sieve Size (inches)	Weight Retained (grams)	Cumulative Weight (grams)	Cumulative % Retained	Cumulative % Passing
3/8	9.525	0.375	171	171	10.0%	90.0%
4	4.760	0.187	97	268	15.7%	84.3%
6	3.353	0.132	92	360	21.1%	78.9%
8	2.360	0.094	169	529	31.0%	69.0%
10	1.999	0.079	93	622	36.5%	63.5%
16	1.191	0.047	344	966	56.6%	43.4%
20	0.841	0.033	235	1201	70.4%	29.6%
40	0.419	0.017	398	1599	93.7%	6.3%
60	0.249	0.010	54	1653	96.9%	3.1%
100	0.150	0.006	30	1683	98.7%	1.3%
200	0.074	0.003	14	1697	99.5%	0.5%
Pan			9	1706	100.0%	0.0%

Total	1706			
Initial Weight	1711	Gravel	Sand	Silt or Clay
Difference	0.3%	36.5%	63.0%	0.5%

	D_{10}	D_{40}	D_{50}	D_{60}	D_{90}	C_u
(mm)	0.468	1.094	1.412	1.825	> 2	3.90
(inches)	0.018	0.043	0.056	0.072	> 0.08	

SIEVE ANALYSIS RESULTS

Client: Kansas City, Missouri/Black and Veatch Corporation
Job No. 1055052

Boring ID: TH2023-WELL-4R
Depth Interval: 95 - 98.5

Sieve Size or Sieve No.	Sieve Size (mm)	Sieve Size (inches)	Weight Retained (grams)	Cumulative Weight (grams)	Cumulative % Retained	Cumulative % Passing
3/8	9.525	0.375	322	322	18.2%	81.8%
4	4.760	0.187	341	663	37.4%	62.6%
6	3.353	0.132	174	837	47.2%	52.8%
8	2.360	0.094	152	989	55.8%	44.2%
10	1.999	0.079	54	1043	58.9%	41.1%
16	1.191	0.047	182	1225	69.1%	30.9%
20	0.841	0.033	105	1330	75.1%	24.9%
40	0.419	0.017	207	1537	86.7%	13.3%
60	0.249	0.010	124	1661	93.7%	6.3%
100	0.150	0.006	63	1724	97.3%	2.7%
200	0.074	0.003	28	1752	98.9%	1.1%
Pan			20	1772	100.0%	0.0%

Total	1772			
Initial Weight	1782	Gravel	Sand	Silt or Clay
Difference	0.6%	58.9%	40.0%	1.1%

	D_{10}	D_{40}	D_{50}	D_{60}	D_{90}	C_u
(mm)	0.329	1.887	2.994	4.341	> 5	13.20
(inches)	0.013	0.074	0.118	0.171	> 0.18	

Boring ID: TH2023-WELL-4R
Depth Interval: 98.5 - 100

Sieve Size or Sieve No.	Sieve Size (mm)	Sieve Size (inches)	Weight Retained (grams)	Cumulative Weight (grams)	Cumulative % Retained	Cumulative % Passing
3/8	9.525	0.375	48	48	3.1%	96.9%
4	4.760	0.187	44	92	5.9%	94.1%
6	3.353	0.132	28	120	7.7%	92.3%
8	2.360	0.094	32	152	9.7%	90.3%
10	1.999	0.079	19	171	11.0%	89.0%
16	1.191	0.047	110	281	18.0%	82.0%
20	0.841	0.033	172	453	29.1%	70.9%
40	0.419	0.017	567	1020	65.4%	34.6%
60	0.249	0.010	243	1263	81.0%	19.0%
100	0.150	0.006	227	1490	95.6%	4.4%
200	0.074	0.003	39	1529	98.1%	1.9%
Pan			30	1559	100.0%	0.0%

Total	1559			
Initial Weight	1558	Gravel	Sand	Silt or Clay
Difference	-0.1%	11.0%	87.1%	1.9%

	D_{10}	D_{40}	D_{50}	D_{60}	D_{90}	C_u
(mm)	0.182	0.465	0.563	0.682	2.28	3.74
(inches)	0.007	0.018	0.022	0.027	0.090	

SIEVE ANALYSIS RESULTS

Client: Kansas City, Missouri/Black and Veatch Corporation
Job No. 1055052

Boring ID: TH2023-WELL-4R
Depth Interval: 100 - 103

Sieve Size or Sieve No.	Sieve Size (mm)	Sieve Size (inches)	Weight Retained (grams)	Cumulative Weight (grams)	Cumulative % Retained	Cumulative % Passing
3/8	9.525	0.375	143	143	8.2%	91.8%
4	4.760	0.187	166	309	17.7%	82.3%
6	3.353	0.132	131	440	25.1%	74.9%
8	2.360	0.094	175	615	35.1%	64.9%
10	1.999	0.079	89	704	40.2%	59.8%
16	1.191	0.047	324	1028	58.7%	41.3%
20	0.841	0.033	182	1210	69.1%	30.9%
40	0.419	0.017	349	1559	89.1%	10.9%
60	0.249	0.010	131	1690	96.6%	3.4%
100	0.150	0.006	43	1733	99.0%	1.0%
200	0.074	0.003	12	1745	99.7%	0.3%
Pan			5	1750	100.0%	0.0%

Total	1750			
Initial Weight	1754	Gravel	Sand	Silt or Clay
Difference	0.2%	40.2%	59.5%	0.3%

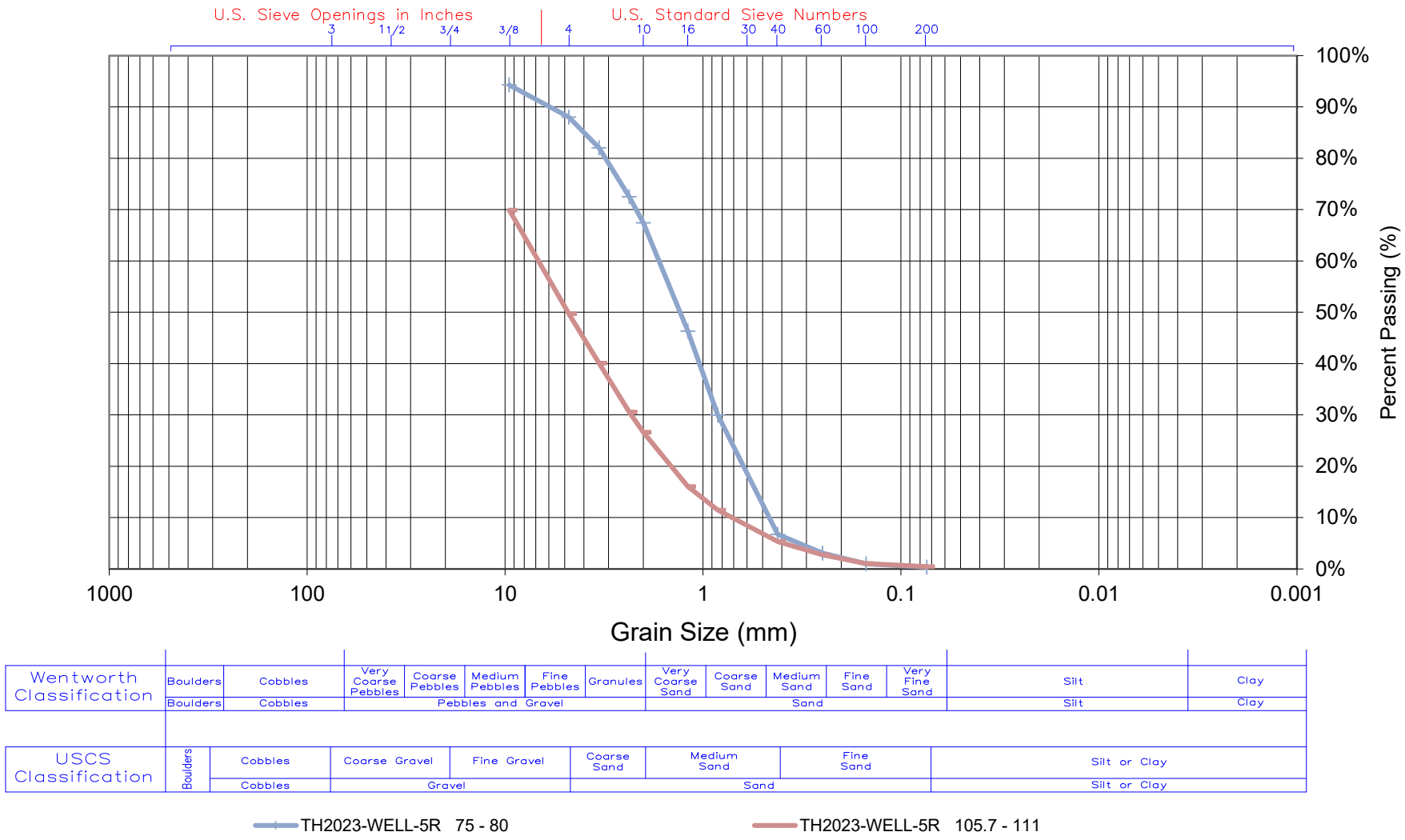
	D_{10}	D_{40}	D_{50}	D_{60}	D_{90}	C_u
(mm)	0.393	1.142	1.521	2.014	8.33	5.12
(inches)	0.015	0.045	0.060	0.079	0.328	

Boring ID: TH2023-WELL-4R
Depth Interval: 103 - 106.5

Sieve Size or Sieve No.	Sieve Size (mm)	Sieve Size (inches)	Weight Retained (grams)	Cumulative Weight (grams)	Cumulative % Retained	Cumulative % Passing
3/8	9.525	0.375	359	359	19.3%	80.7%
4	4.760	0.187	273	632	34.0%	66.0%
6	3.353	0.132	160	792	42.6%	57.4%
8	2.360	0.094	175	967	52.0%	48.0%
10	1.999	0.079	80	1047	56.3%	43.7%
16	1.191	0.047	236	1283	69.0%	31.0%
20	0.841	0.033	115	1398	75.2%	24.8%
40	0.419	0.017	234	1632	87.8%	12.2%
60	0.249	0.010	136	1768	95.1%	4.9%
100	0.150	0.006	51	1819	97.8%	2.2%
200	0.074	0.003	24	1843	99.1%	0.9%
Pan			16	1859	100.0%	0.0%

Total	1859			
Initial Weight	1862	Gravel	Sand	Silt or Clay
Difference	0.2%	56.3%	42.8%	0.9%

	D_{10}	D_{40}	D_{50}	D_{60}	D_{90}	C_u
(mm)	0.358	1.720	2.544	3.728	> 4	10.41
(inches)	0.014	0.068	0.100	0.147	> 0.15	

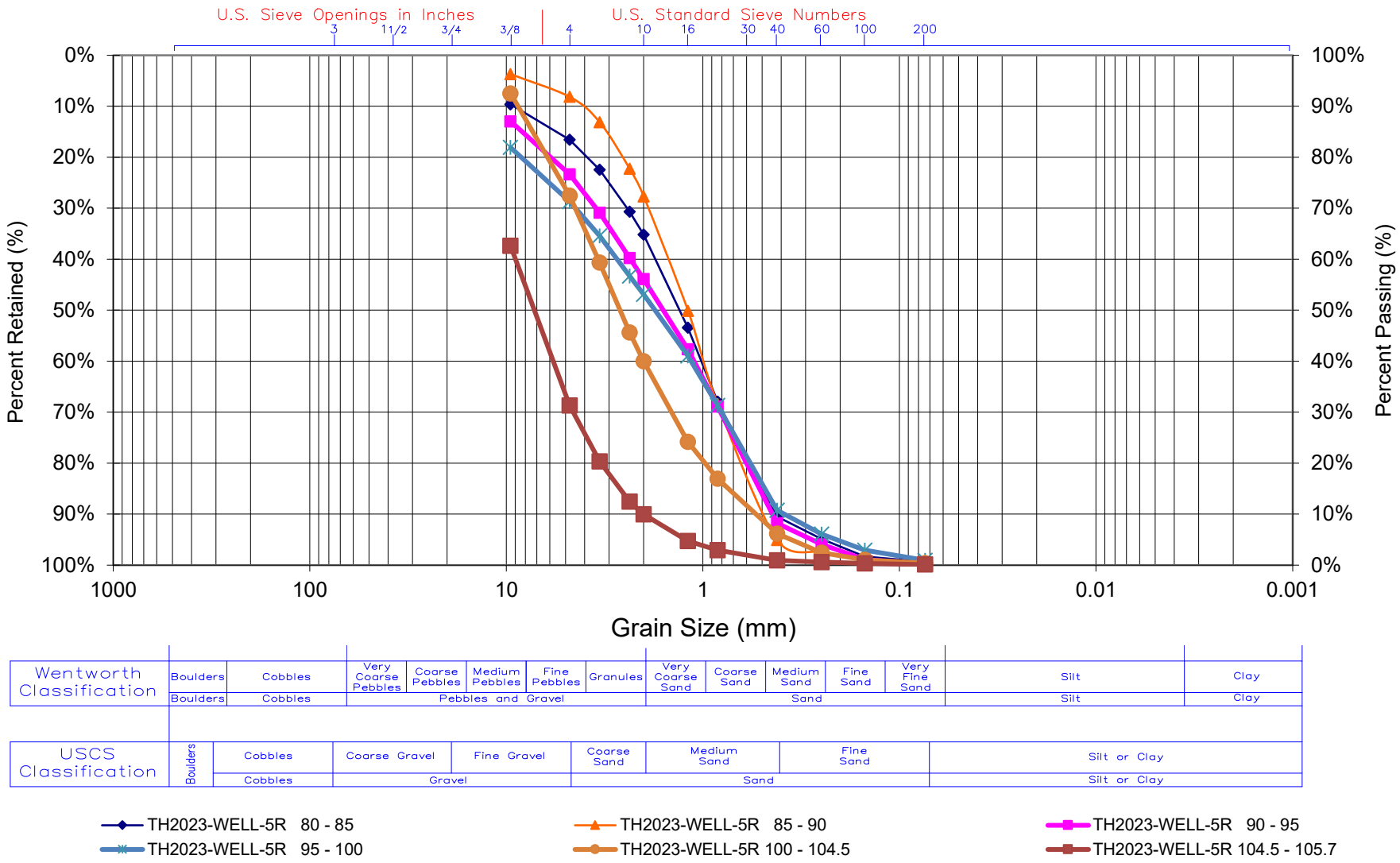


Layne
A GRANITE COMPANY

GRAIN SIZE ANALYSIS

Layne - Ranney Collector Wells

Project: Kansas City, Missouri/Black and Veatch Corporation
Boring ID: TH2023-WELL-5R
Job Number: 1055052



GRAIN SIZE ANALYSIS

Layne - Ranney Collector Wells

Project: Kansas City, Missouri/Black and Veatch Corporation

Boring ID: TH2023-WELL-5R

Job Number: 1055052

SIEVE ANALYSIS RESULTS

Client: Kansas City, Missouri/Black and Veatch Corporation
Job No. 1055052

Boring ID: TH2023-WELL-5R
Depth Interval: 75 - 80

Sieve Size or Sieve No.	Sieve Size (mm)	Sieve Size (inches)	Weight Retained (grams)	Cumulative Weight (grams)	Cumulative % Retained	Cumulative % Passing
3/8	9.525	0.375	98	98	5.7%	94.3%
4	4.760	0.187	107	205	12.0%	88.0%
6	3.353	0.132	103	308	18.0%	82.0%
8	2.360	0.094	163	471	27.5%	72.5%
10	1.999	0.079	87	558	32.6%	67.4%
16	1.191	0.047	361	919	53.7%	46.3%
20	0.841	0.033	280	1199	70.0%	30.0%
40	0.419	0.017	398	1597	93.3%	6.7%
60	0.249	0.010	62	1659	96.9%	3.1%
100	0.150	0.006	36	1695	99.0%	1.0%
200	0.074	0.003	11	1706	99.6%	0.4%
Pan			6	1712	100.0%	0.0%

Total	1712			
Initial Weight	1716	Gravel	Sand	Silt or Clay
Difference	0.2%	32.6%	67.1%	0.4%

	D_{10}	D_{40}	D_{50}	D_{60}	D_{90}	C_u
(mm)	0.462	1.041	1.304	1.667	5.93	3.60
(inches)	0.018	0.041	0.051	0.066	0.233	

Boring ID: TH2023-WELL-5R
Depth Interval: 105.7 - 111

Sieve Size or Sieve No.	Sieve Size (mm)	Sieve Size (inches)	Weight Retained (grams)	Cumulative Weight (grams)	Cumulative % Retained	Cumulative % Passing
3/8	9.525	0.375	629	629	30.1%	69.9%
4	4.760	0.187	422	1051	50.3%	49.7%
6	3.353	0.132	201	1252	59.9%	40.1%
8	2.360	0.094	199	1451	69.5%	30.5%
10	1.999	0.079	82	1533	73.4%	26.6%
16	1.191	0.047	221	1754	84.0%	16.0%
20	0.841	0.033	96	1850	88.6%	11.4%
40	0.419	0.017	128	1978	94.7%	5.3%
60	0.249	0.010	54	2032	97.3%	2.7%
100	0.150	0.006	36	2068	99.0%	1.0%
200	0.074	0.003	12	2080	99.6%	0.4%
Pan			9	2089	100.0%	0.0%

Total	2089			
Initial Weight	2148	Gravel	Sand	Silt or Clay
Difference	2.7%	73.4%	26.2%	0.4%

	D_{10}	D_{40}	D_{50}	D_{60}	D_{90}	C_u
(mm)	0.714	3.345	4.811	6.782	> 7	9.50
(inches)	0.028	0.132	0.189	0.267	> 0.27	

SIEVE ANALYSIS RESULTS

Client: Kansas City, Missouri/Black and Veatch Corporation
Job No. 1055052

Boring ID: TH2023-WELL-5R
Depth Interval: 80 - 85

Sieve Size or Sieve No.	Sieve Size (mm)	Sieve Size (inches)	Weight Retained (grams)	Cumulative Weight (grams)	Cumulative % Retained	Cumulative % Passing
3/8	9.525	0.375	153	153	9.6%	90.4%
4	4.760	0.187	110	263	16.6%	83.4%
6	3.353	0.132	94	357	22.5%	77.5%
8	2.360	0.094	131	488	30.7%	69.3%
10	1.999	0.079	71	559	35.2%	64.8%
16	1.191	0.047	290	849	53.4%	46.6%
20	0.841	0.033	231	1080	68.0%	32.0%
40	0.419	0.017	358	1438	90.5%	9.5%
60	0.249	0.010	70	1508	94.9%	5.1%
100	0.150	0.006	54	1562	98.3%	1.7%
200	0.074	0.003	17	1579	99.4%	0.6%
Pan			10	1589	100.0%	0.0%

Total	1589			
Initial Weight	1589	Gravel	Sand	Silt or Clay
Difference	0.0%	35.2%	64.2%	0.6%

	D_{10}	D_{40}	D_{50}	D_{60}	D_{90}	C_u
(mm)	0.425	1.018	1.313	1.743	9.18	4.10
(inches)	0.017	0.040	0.052	0.069	0.361	

Boring ID: TH2023-WELL-5R
Depth Interval: 85 - 90

Sieve Size or Sieve No.	Sieve Size (mm)	Sieve Size (inches)	Weight Retained (grams)	Cumulative Weight (grams)	Cumulative % Retained	Cumulative % Passing
3/8	9.525	0.375	59	59	3.7%	96.3%
4	4.760	0.187	71	130	8.2%	91.8%
6	3.353	0.132	79	209	13.1%	86.9%
8	2.360	0.094	145	354	22.2%	77.8%
10	1.999	0.079	87	441	27.7%	72.3%
16	1.191	0.047	357	798	50.1%	49.9%
20	0.841	0.033	292	1090	68.5%	31.5%
40	0.419	0.017	424	1514	95.1%	4.9%
60	0.249	0.010	37	1551	97.4%	2.6%
100	0.150	0.006	23	1574	98.9%	1.1%
200	0.074	0.003	10	1584	99.5%	0.5%
Pan			8	1592	100.0%	0.0%

Total	1592			
Initial Weight	1593	Gravel	Sand	Silt or Clay
Difference	0.1%	27.7%	71.8%	0.5%

	D_{10}	D_{40}	D_{50}	D_{60}	D_{90}	C_u
(mm)	0.479	0.988	1.194	1.505	4.18	3.14
(inches)	0.019	0.039	0.047	0.059	0.165	

SIEVE ANALYSIS RESULTS

Client: Kansas City, Missouri/Black and Veatch Corporation
Job No. 1055052

Boring ID: TH2023-WELL-5R
Depth Interval: 90 - 95

Sieve Size or Sieve No.	Sieve Size (mm)	Sieve Size (inches)	Weight Retained (grams)	Cumulative Weight (grams)	Cumulative % Retained	Cumulative % Passing
3/8	9.525	0.375	243	243	13.0%	87.0%
4	4.760	0.187	195	438	23.4%	76.6%
6	3.353	0.132	141	579	30.9%	69.1%
8	2.360	0.094	167	746	39.8%	60.2%
10	1.999	0.079	77	823	43.9%	56.1%
16	1.191	0.047	258	1081	57.7%	42.3%
20	0.841	0.033	211	1292	68.9%	31.1%
40	0.419	0.017	429	1721	91.8%	8.2%
60	0.249	0.010	78	1799	95.9%	4.1%
100	0.150	0.006	56	1855	98.9%	1.1%
200	0.074	0.003	15	1870	99.7%	0.3%
Pan			5	1875	100.0%	0.0%

Total	1875			
Initial Weight	1878	Gravel	Sand	Silt or Clay
Difference	0.2%	43.9%	55.8%	0.3%

	D_{10}	D_{40}	D_{50}	D_{60}	D_{90}	C_u
(mm)	0.442	1.108	1.589	2.340	> 3	5.29
(inches)	0.017	0.044	0.063	0.092	> 0.1	

Boring ID: TH2023-WELL-5R
Depth Interval: 95 - 100

Sieve Size or Sieve No.	Sieve Size (mm)	Sieve Size (inches)	Weight Retained (grams)	Cumulative Weight (grams)	Cumulative % Retained	Cumulative % Passing
3/8	9.525	0.375	305	305	18.1%	81.9%
4	4.760	0.187	179	484	28.7%	71.3%
6	3.353	0.132	114	598	35.4%	64.6%
8	2.360	0.094	133	731	43.3%	56.7%
10	1.999	0.079	60	791	46.9%	53.1%
16	1.191	0.047	204	995	59.0%	41.0%
20	0.841	0.033	164	1159	68.7%	31.3%
40	0.419	0.017	347	1506	89.3%	10.7%
60	0.249	0.010	79	1585	94.0%	6.0%
100	0.150	0.006	53	1638	97.1%	2.9%
200	0.074	0.003	33	1671	99.1%	0.9%
Pan			16	1687	100.0%	0.0%

Total	1687			
Initial Weight	1694	Gravel	Sand	Silt or Clay
Difference	0.4%	46.9%	52.2%	0.9%

	D_{10}	D_{40}	D_{50}	D_{60}	D_{90}	C_u
(mm)	0.386	1.148	1.750	2.738	> 3	7.08
(inches)	0.015	0.045	0.069	0.108	> 0.11	

SIEVE ANALYSIS RESULTS

Client: Kansas City, Missouri/Black and Veatch Corporation
Job No. 1055052

Boring ID: TH2023-WELL-5R
Depth Interval: 100 - 104.5

Sieve Size or Sieve No.	Sieve Size (mm)	Sieve Size (inches)	Weight Retained (grams)	Cumulative Weight (grams)	Cumulative % Retained	Cumulative % Passing
3/8	9.525	0.375	130	130	7.5%	92.5%
4	4.760	0.187	348	478	27.6%	72.4%
6	3.353	0.132	227	705	40.7%	59.3%
8	2.360	0.094	238	943	54.4%	45.6%
10	1.999	0.079	98	1041	60.0%	40.0%
16	1.191	0.047	274	1315	75.8%	24.2%
20	0.841	0.033	125	1440	83.0%	17.0%
40	0.419	0.017	187	1627	93.8%	6.2%
60	0.249	0.010	65	1692	97.6%	2.4%
100	0.150	0.006	24	1716	99.0%	1.0%
200	0.074	0.003	11	1727	99.6%	0.4%
Pan			7	1734	100.0%	0.0%

Total	1734			
Initial Weight	1738	Gravel	Sand	Silt or Clay
Difference	0.2%	60.0%	39.6%	0.4%

	D_{10}	D_{40}	D_{50}	D_{60}	D_{90}	C_u
(mm)	0.537	2.001	2.640	3.413	8.74	6.36
(inches)	0.021	0.079	0.104	0.134	0.344	

Boring ID: TH2023-WELL-5R
Depth Interval: 104.5 - 105.7

Sieve Size or Sieve No.	Sieve Size (mm)	Sieve Size (inches)	Weight Retained (grams)	Cumulative Weight (grams)	Cumulative % Retained	Cumulative % Passing
3/8	9.525	0.375	657	657	37.4%	62.6%
4	4.760	0.187	550	1207	68.7%	31.3%
6	3.353	0.132	193	1400	79.7%	20.3%
8	2.360	0.094	138	1538	87.5%	12.5%
10	1.999	0.079	44	1582	90.0%	10.0%
16	1.191	0.047	92	1674	95.3%	4.7%
20	0.841	0.033	32	1706	97.1%	2.9%
40	0.419	0.017	35	1741	99.1%	0.9%
60	0.249	0.010	6	1747	99.4%	0.6%
100	0.150	0.006	4	1751	99.7%	0.3%
200	0.074	0.003	4	1755	99.9%	0.1%
Pan			2	1757	100.0%	0.0%

Total	1757			
Initial Weight	1765	Gravel	Sand	Silt or Clay
Difference		90.0%	9.8%	0.1%

	D_{10}	D_{40}	D_{50}	D_{60}	D_{90}	C_u
(mm)	2.004	5.772	7.203	8.990	> 9	4.49
(inches)	0.079	0.227	0.284	0.354	> 0.36	

CITY OF FOUNTAINS
HEART OF THE NATION

KANSAS CITY
MISSOURI

REQUEST FOR INTERPRETATION

Project/Contract Numbers 80002543/9911

Project Title Vertical Wells 2-5 Replacement

Contractor _____

RFI Number _____ Date _____

From: _____

To: _____

Re: _____

Spec. Sec. Ref: Paragraph: Drawing Ref: Detail:

Signed:

Response:

❑ Attachments

Response From: To: Date Transmitted:_____ Date Rec'd:_____

Signed:_____ Signed:_____
Design Professional Owner's Representative

Distribution:
- ❑ Owner
- ❑ Contractor
- ❑ Construction Manager
- ❑ Design Professional
- ❑ Consultant _____
- ❑ Other _____

CITY OF FOUNTAINS
HEART OF THE NATION

KANSAS CITY
MISSOURI

REQUEST FOR INTERPRETATION LOG

Project/Contract Numbers 80002543/9911

Project Title Vertical Wells 2-5 Replacement

CONTRACTOR _____

OWNER _____

RFI No.	Issue Date	Brief Description of issue and response	Respond Date

CITY OF FOUNTAINS
HEART OF THE NATION

KANSAS CITY
MISSOURI

SUPPLEMENTAL DESIGN INSTRUCTION

Project/Contract Numbers 80002543/9911

Project Title Vertical Wells 2-5 Replacement

To Contractor _____

From: _____ SDI No _____ Issue Date: _____

The Work shall be carried out in accordance with the following supplemental instructions issued in accordance with the Contract Documents without change in Contract Price or Contract Times. Proceeding with the Work in accordance with these instructions indicates your acknowledgement that there will be no change in the Contract Price or Contract Times.

Description:

❑ Attachments *(List)*

(Signature) Design Professional Date

Distribution:
- ❑ Owner
- ❑ Contractor
- ❑ Construction Manager
- ❑ Design Professional
- ❑ Consultant _____
- ❑ Other _____

CITY OF FOUNTAINS
HEART OF THE NATION

KANSAS CITY
MISSOURI

REQUEST FOR PROPOSAL

Project/Contract Numbers 80002543/9911

Project Title Vertical Wells 2-5 Replacement

To Contractor _____

From: _____ RFP No _____ Issue Date: _____

Please submit an itemized proposal for changes in the Contract Price and Contract Times for proposed modifications to the Contract Documents described herein. Submit proposal within _____ days, or notify the Owner in writing of the date on which you anticipate submitting your proposal.

This is NOT a Change Order, a Work Change Directive or a direction to proceed with the work described in the proposed modifications.

Description:

❑ Attachments

Prepared by Design Professional

Prepared by Construction Manager

REQUESTED by OWNER'S Representative

Distribution:
- ❑ Owner
- ❑ Contractor
- ❑ Construction Manager
- ❑ Design Professional
- ❑ Consultant _____
- ❑ Other _____

CITY OF FOUNTAINS
HEART OF THE NATION

KANSAS CITY
MISSOURI

REQUEST FOR PROPOSAL LOG

Project/Contract Numbers 80002543/9911

Project Title Vertical Wells 2-5 Replacement

CONTRACTOR _____

OWNER _____

RFP No.	Issue Date	Brief Description of Request	Respond Date	Amount	CO No.

CITY OF FOUNTAINS
HEART OF THE NATION

KANSAS CITY
MISSOURI

CHANGE ORDER

Project Number/Contract Number _____

Project Title _____

Change Order No: _____ Date of Issuance: _____

Ordinance No: _____ Ordinance Effective Date: _____

Contract Notice To Proceed Date: _____

To CONTRACTOR: (Enter Contractor's Company Name)

The Contract is changed as follows: _____

This Change Order constitutes compensation in full on behalf of the Contractor and its subcontractors and suppliers for all costs, including impact costs and extended general conditions, and markups directly and indirectly attributable to the Work changes ordered herein, for all delays related thereto and for performance of the changes within the time stated. Contractor hereby releases all claims for delay, interruption, extended general conditions, impact and cumulative impact claims for this Work.

[**Note**: Identify the specific attachments; example: "Attachment A, Additional Scope of Services."] **Delete all notes before printing final**

☐ See Attached Document(s) Flysheets needed before each attachment

A - Updated Certificate of Insurance

B-

C.D.E…...

[**Note:** If the CO does not change the Contract Price, use "Director of Water Services" instead of "Director of Finance"]

Not valid until signed by the Director of Finance.

The original Contract Price was	$0.00
Net change by previously authorized Change Orders	$0.00
The Contract Price prior to this Change Order was	$0.00
The Contract Price will be (☐ increased by) (☐ decreased by) (☐ unchanged)	$0.00
The new Contract Price including this Change Order will be	$0.00

[Note: If revised, establish and enter new dates. If unchanged, enter current contract dates.
If you are only changing the Final Completion date, add the following reference:
"The Contract Time for Final Completion will be . . ."]

The Contract Time will be (☐ increased by) (☐ decreased by) (☐ unchanged)	( ) calendar days
The date of Substantial Completion as of the date of this Change Order therefore is	Enter Date
The date of Final Completion as of the date of this Change Order therefore is	Enter Date

Project No. _____ Project Title_____
Change Order No.

[**Note:** Include any required additional signatures.]

DESIGN PROFESSIONAL: **Name (Type Company Name)**	**By:** **Title:**	(type Name) (type Title)	**Date:**
CONTRACTOR: **Name (Type Company Name)**	**By:** **Title:**	(type Name) (type Title)	**Date:**
CITY: **KC Water**	**By** **Title:**	CEO/SSO/OO's name CEO/SSO/OO's title	**Date:**

Approved as to form: _____
Assistant City Attorney

[**Note**: If this CO does not change the Contract Price, delete the cert. of funds by Finance Director but send signed copy to Finance.]

I certify there is a balance otherwise unencumbered to the credit of the appropriation to which the above amount is chargeable, and a cash balance otherwise unencumbered in the treasury to the credit of the fund from which payment is to be made, each sufficient to meet the above obligation.

By: _____
Director of Finance Date

Distribution:
- ❑ CITY
- ❑ CONTRACTOR
- ❑ DESIGN PROFESSIONAL

REMINDER: CONTRACTOR is responsible for considering the effect this Change Order may have on its ability to meet or exceed the D/M/WBE participation amounts in its Contractor Utilization Plan (CUP) as amended by any previously approved Request for Modification/Substitution. If CONTRACTOR will not be able to achieve the approved participation amounts in performing the work included within this Change Order, or if CONTRACTOR needs to retain the services of additional D/M/WBEs not previously listed in its CUP, CONTRACTOR is advised to submit a Request for Modification/Substitution.

CITY OF FOUNTAINS
HEART OF THE NATION

KANSAS CITY
MISSOURI

WORK CHANGE DIRECTIVE

Project/Contract Numbers 80002543/9911

Project Title Vertical Wells 2-5 Replacement

No.: _____ Date of Issuance: _____

TO:
(CONTRACTOR)

You are directed to proceed promptly with the following work:

Description:

Purpose of Work Change Directive:

Attachments: *(List documents supporting change)*

If the above work results on a change in the Contract Price or Contract Times, any request 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:	Method of determining change in Contract Times:
❑ Unit Prices	❑ CONTRACTOR's Records
❑ Lump Sum	❑ DESIGN PROFESSIONAL's Records
❑ As Stipulated in General Conditions	❑ City's Records
❑ Other _____	❑ Other _____
Estimated increase (decrease) in Contract Price:	Estimated increase (decrease) in Contract Times:
$ _____	Substantial Completion: _____ days;
If the change involves an increase, the estimated Amount is not to be exceeded without further authorization.	Final Completion: _____ days. If the change involves an increase, the estimated times are not to be exceeded without further authorization.

Recommended:	Recommended:	Recommended:
DESIGN PROFESSIONAL	Construction Manager	City
By (Authorized Signature)	By (Authorized Signature)	By (Authorized Signature)

Distribution:
❑ City
❑ Contractor
❑ Construction Manager
❑ Design Professional
❑ Consultant
❑ Other

WORK CHANGE DIRECTIVE ("WCD") INSTRUCTIONS

[Note: Do not attach these instructions to the WCD Form]

A. GENERAL INFORMATION

This document was developed for use in situations involving changes in the Work which, 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. If the WCD may result in an increase in the Contract Price, a contract impact cost analysis must be performed prior to issuing the WCD. Availability of funds and authorization to expend funds must be part of the analysis.

For supplemental instructions and minor changes not involving a possible change in the Contract Price or the Contract Times a Supplemental Design Instruction may be used.

B. COMPLETING THE WORK CHANGE DIRECTIVE FORM

Based on conversations between Design Professional, City's Representative and CONTRACTOR, Design Professional must complete the following:

DESCRIPTION: shall include a summary of the Work included in the WCD. Additional information may be attached to the WCD to further define the scope.

PURPOSE OF WORK CHANGE DIRECTIVE: will identify clearly if the Work included in the WCD is an addition, deletion, revision, or some combination.

ATTACHMENTS: shall identify all attachments included in and made a part of the WCD. Be certain that attachments are clearly labeled.

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 WCD must be issued to change the estimated price. Do not leave blank spaces or write "To be determined" (or "TBD"). An estimated dollar figure must be assigned to the Work. If the WCD is not likely to change the Contract Price, the space for estimated increase (decrease) should be marked "No Change in Price".

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 decrease 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 WCD must be issued to change the times or CONTRACTOR may stop the changed Work when the estimated times are reached. Do not leave blank spaces or write "To be determined" (or "TBD"). If the WCD is not likely to change the Contract Times, the space for estimated increase (decrease) should be marked "No Change in Times".

Once Design Professional has completed and signed the form, all copies should be sent to CITY for authorization because Design Professional does not have authority to authorize changes in Price or Times. Once authorized by CITY, a copy must be sent by Design Professional to CONTRACTOR. Price and Times may only be changed by Change Order signed by CITY, Design Professional, and CONTRACTOR. If the value of the work included in the WCD exceeds the contingency or budget available for the contract, staff must obtain written approval from the Director or his or her designee before the WCD is issued. A Director or his or her designee may not approve a WCD that will exceed City Council authorization. If the work included in the WCD is needed as a result of an emergency, staff may proceed with the issuance of the WCD without

prior written approval even if the value of the work added is expected to exceed the contract contingency balance.

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

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

CITY OF FOUNTAINS
HEART OF THE NATION

KANSAS CITY
MISSOURI

ALLOWANCE AUTHORIZATION

Project Number _____

Project Title _____

To: _____

_____

Re: _____

_____

Authorization Number: _____

From: _____

Date: _____

Contract For: _____

You are authorized to perform the following item(s) of work and to adjust the Allowance Sum accordingly:

This is NOT a CHANGE ORDER and does NOT INCREASE OR DECREASE the CONTRACT AMOUNT.

Original Allowance	$_____
Allowance Expenditures prior to this Authorization	$_____
Allowance Balance prior to this Authorization	$_____
Allowance will be [❑ increased] [❑ decreased] by this Authorization	$_____
New Allowance Balance	$_____

APPROVAL RECOMMENDED

_____
Design Professional Date

_____
Construction Manager Date

CITY APPROVAL

_____
City's Representative Date

CONTRACTOR ACCEPTANCE

_____
Contractor Date

❑ Attachments:

Distribution:
- ❑ City
- ❑ Contractor
- ❑ Construction Manager
- ❑ Design Professional
- ❑ Consultant
- ❑ Other

APPLICATION FOR PAYMENT

Project Number _____

Project Title _____

Final Payment[5] ☐

CONTRACTOR

Address

Application Number[2]: _____
Date: _____
Ordinance/Resolution Number: _____
Effective: _____
PO Number _____
Vendor Number _____

Application for Work Accomplished from _____ to _____

Original Contract Price		[1]			$	-
Net by Change Orders___through___				[2]	$	-
Current Contract Price (1+2)				[3]	$	-
Completed Work		[4]	$ -			
Disputed Amounts[3]	[-]	[4a]	$ -			
Stored Material[4]		[5]	$ -			
Disputed Amounts[3]	[-]	[5a]	$ -			
Total Completed and Stored to Date (4+5)				[6]	$	-
Previous Payments		[7]	$ -			
Previous Retainage		[8]	$ -			
Total Previous Applications (7+8)				[9]	$	-
Amount This Application (6-9)				[10]	$	-
Less Retainage This Application (5%)				[-] [11]	$	-
Release of Retainage				[12]	$	-
Total Due This Application (10-11+12)				[13]	$	-
Liquidated Damages						
Completion of Work		[14]	$ -	[-]	$	-
Prevailing Wage[7]		[15]	$ -	[-]	$	-
MBE/WBE Program[7]		[16]	$ -	[-]	$	-
Workforce Program[7]		[17]	$ -	[-]	$	-
Total Amount Due Contractor (13 - 14 through 17)				[18]	$	-

Accompanying Documentation: [1, 2, 3, 4, 5, & 6] and any other information as necessary.

NOTE: Initial all figures on this Application and on the Schedule of Values that are changed to correct errors or conform to the amount recommended. Attach explanation of changes that have been made.

CONTRACTOR's Certification:

The undersigned CONTRACTOR certifies that (a) all previous progress payments received from OWNER on account of Work done under this Contract have been applied on account to discharge CONTRACTOR's legitimate obligations incurred in connection with Work covered by all prior Applications for Payment; (b) at time of payment, title of all Work, materials and equipment incorporated into said Work or otherwise listed in or covered by this Application for Payment will pass to OWNER free and clear of all Liens, security interests and encumbrances (except such as are covered by a Bond acceptable to OWNER indemnifying OWNER against any such Lien, security interest or encumbrance); and (c) all Work covered by this Application for Payment is in accordance with the Contract Documents and not defective; and (d) all manufactured goods or commodities used or supplied for this Project are in compliance with Kansas City's Buy America ordinance.

_____ By _____ _____

Contractor | Authorized Representative (Print) | Signature

Date_____

State of)
)SS
County of)

Subscribed and Sworn to before me this _____ day of _____, _____ .

My commission expires:

_____ Notary Public: _____

DESIGN PROFESSIONAL's Recommendation of Payment:

In accordance with the Contract Documents, based on on-Site observations and the data comprising this application, the DESIGN PROFESSIONAL recommends to the OWNER that to the best of the DESIGN PROFESSIONAL's knowledge, information and belief the Work has progressed as indicated, the quality of the Work is in accordance with the Contract Documents, and the CONTRACTOR is entitled to payment of the Amount above listed in this application.

Name of firm (Print)	DESIGN PROFESSIONAL (Print)	(Signature)

Date: _____

Construction/Program Manager's Recommendation of Payment: (if applicable)

In accordance with the Contract Documents, based on on-Site observations and the data comprising this application, the Construction/Program Manager recommends to the OWNER that to the best of the Construction/Program Manager's knowledge, information and belief the Work has progressed as indicated, the quality of the Work is in accordance with the Contract Documents, and the CONTRACTOR is entitled to payment of the Amount above listed in this application.

Construction/Program Manager firm (Print)	Authorized Representative (Print)	(Signature)

Date: _____

City's Representative's Agreement with Recommendation of Payment

City's Representative(print)	(Signature)	(Date)

City's Approval

The amount previously recommended is approved for payment.

Director or Designee (Print)	(Signature)	(Date)

[1]See General Conditions Article 14.02 A and B

[2]Proof of tax compliance if 1st payment and if Contract amount exceeds $150,000.00

[3]Schedule of Values–Denote any amounts currently disputed in this application. Attach additional dispute documentation if required.

[4]If requesting payment for stored materials, see General Conditions Article 14.02 A.1

[5]If final payment, current proof of tax compliance if Contract is longer than 1 year and amount exceeds $150,000.00.

[6] Per General Conditions Sec. 14.02 attach a copy of the most recent 00485.01 M/WBE Monthly Utilization Report, 00485.02 Project Workforce Monthly Report and 00485.03 Company-Wide Workforce Monthly Report CONTRACTOR has submitted to the City's Human Relations Department

[7]Applicable only if final payment

REMINDER: CONTRACTOR is responsible for meeting or exceeding the the D/M/WBE participation amounts in its Contractor Utilization Plan (CUP) as amended by any previously approved Request for Modification/Substitution. Any Change Orders or amendements modifying the amount CONTRACTOR is to be compensated will have correspondingly impacted the amount of compensation due D/M/WBEs for purposes of meeting or exceeding the Bidder/Proposer participation. CONTRACTOR is again reminded to consider the effect of any Change Order or amendment, and to submit a Request for Modification/Substitution if appropriate.

Distribution: Owner, Contractor, Construction Manager, Project Manager, Design Professional

CITY OF FOUNTAINS
HEART OF THE NATION
KANSAS CITY
MISSOURI

SCHEDULE OF VALUES

Project /contract Number 80002543/9411

Project Title

HRD APPROVED CUP		
MBE	WBE	DBE
$0.00	$0.00	$0.00
%	%	%

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
SPEC SECTION	UNIT PRICE CONTRACTS			DESCRIPTION OF WORK UNIT ITEM DESCRIPTION	$ UNIT PRICE	NO. OF UNITS	$ TOTAL OR LUMP SUM	UNITS COMPLETE	$ COMPLETED WORK	$ STORED MATERIAL	$ TOTAL COMPLETED AND STORED TO DATE		TOTALS TO DATE			% AT BOTTOM	$ TOTAL PREVIOUS APPLICATIONS	$ AMOUNT THIS APPLICATION L-R
	UNIT ITEM NO.	UNIT	ESTIMATED QUANTITY								$ J+K	% J/H	$ MBE	$ WBE	$ DBE			
																P/L		
																O/L		
																N/L		

CITY OF FOUNTAINS
HEART OF THE NATION

KANSAS CITY
MISSOURI

SUBCONTRACTORS AND MAJOR MATERIAL SUPPLIERS LIST

Project/Contract Numbers 80002543/9911

Project Title Vertical Wells 2-5 Replacement

From Contractor _____ To _____ Date __

Spec. No.	Section Title	4	Firm, Address (Check box if Supplier)	Phone, FAX and e-mail	Contact

❑ Attachments:

Signed by: _____ Date _____

Distribution: ❑ Owner ❑ Contractor ❑ Construction Manager ❑ Design Professional ❑ Consultant ❑ Other

CITY OF FOUNTAINS
HEART OF THE NATION

KANSAS CITY
MISSOURI

DAILY LABOR FORCE REPORT

Project /Contract No.80002543/9911 Day ____ Date _____
Project Title Vertical Wells 2-5 Replacement
Contractor _____
Subcontractor _____

Weather: (Indicate if weather prevented work and why) _____
_____
_____

Shift: (circle) 5–8 hr Days 4–10 hr Days Other _____

* This report *MUST be completed and turned in* for EACH DAY until FINAL COMPLETION.

Worker's Full Legal Name	**Occupational Title or Classification Group & Skill**	**Hours Worked & Time (i.e. 10AM – 4PM)**	**Race & Gender**

I CERTIFY THAT ALL OF THE INFORMATION PROVIDED ABOVE IS TRUE AND COMPLETE.
Contractor/Subcontractor Representative:

Complete Name: (print) _____Title: (print) _____

Signature: _____ Page ____ of ____

Distribution: ❑ City Department ❑ Contractor ❑ Subcontractor ❑ Other

CERTIFICATE OF ACHIEVEMENT OF FULL OPERATION

Project/Contract Numbers 80002543/9911

Project Title Vertical Wells 2-5 Replacement

CONTRACT FOR: _____

CONTRACTOR: _____

DATE OF ISSUANCE: _____

PROJECT OR DESIGNATED PORTION SHALL INCLUDE:
The Work performed under this Smart Sewer Program Contract has been reviewed and found, to the Design Professional's, Project Manager's, and Construction Manager's best knowledge, information, and belief, to have achieved a state of full operation. Achievement of full operation is the state where completion of construction and installation of equipment or infrastructure such that the equipment or infrastructure has been placed into full operation and is expected to both function and perform as designed. The date of Achievement of full operation of this Project is hereby established as _____. This is also the date the work can be utilized for the purposes for which it is intended and is ready for the City's continuous use. The correction period required by the Contract Documents shall commence on this date, except as stated below.

A list of items to be completed or corrected before final payment is attached hereto. The failure to include any items on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

CONTRACTOR	BY	DATE
DESIGN PROFESSIONAL	BY	DATE

The Contractor will complete or correct the Work on the list of items attached hereto within _____ days from the above date of Achievement of Full Operation.

SMART SEWER PROJECT MANAGER	BY	DATE
SMART SEWER CONSTRUCTION MANAGER	BY	DATE
SMART SEWER DIVISON HEAD	BY	DATE
SMART SEWER OFFICER	BY	DATE

Distribution:
- ❑ Smart Sewer Officer
- ❑ Smart Sewer Division Head
- ❑ Contractor
- ❑ Construction Manager
- ❑ Design Professional
- ❑ Consultant _____
- ❑ Other _____

DRAFT

CITY OF FOUNTAINS
HEART OF THE NATION

KANSAS CITY
MISSOURI

CERTIFICATE OF SUBSTANTIAL COMPLETION

Project/Contract Numbers 80002543/9911

Project Title Vertical Wells 2-5 Replacement

CONTRACT FOR: _____

CONTRACTOR: _____

DATE OF ISSUANCE: _____

PROJECT OR DESIGNATED PORTION SHALL INCLUDE:

The Work performed under this Contract has been reviewed and found, to the Design Professional's and/or Construction Manager's best knowledge, information and belief, to be substantially complete. Substantial Completion is the state in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so the Owner can occupy or utilize the Work for its intended use. The date of Substantial Completion of Project or portion thereof designated above is hereby established as _____ which is also the date of commencement of applicable warranties required by the Contract Documents, except as stated below:

A list of items to be completed or corrected is attached hereto. The failure to include any items on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

CONSTRUCTION MANAGER	BY	DATE
DESIGN PROFESSIONAL	BY	DATE

The Contractor will complete or correct the Work on the list of items attached hereto within _____ days from the above date of Substantial Completion.

CONSTRUCTION MANAGER	BY	DATE
DESIGN PROFESSIONAL	BY	DATE

The Owner accepts the Work or designated portion thereof as substantially complete and will assume full possession thereof at _____ (time) on _____(date).

OWNER'S REPRESENTATIVE	BY	DATE

Distribution:
- ❑ Owner
- ❑ Contractor
- ❑ Construction Manager
- ❑ Design Professional
- ❑ Consultant _____
- ❑ Other _____

CITY OF FOUNTAINS
HEART OF THE NATION

KANSAS CITY
MISSOURI

PUNCH LIST

Project/Contract Numbers 80002543/9911

Project Title Vertical Wells 2-5 Replacement

CONTRACTOR _____

From _____ Site Visit Date _____

The following items require the attention of the CONTRACTOR for completion or correction. This list may not be all-inclusive, and the failure to include any items on this list does not alter the responsibility of the CONTRACTOR to complete all Work in accordance with the Contract Documents.

Item No.	Location (Area)	Description	Correction/ Completion Date	Verification Check

❑ Attachments

Signed by: Date:

DESIGN PROFESSIONAL (Firm/In House)

Distribution:
- ❑ OWNER
- ❑ CONTRACTOR
- ❑ DESIGN PROFESSIONAL
- ❑ Consultant _____
- ❑ Other _____

CITY OF FOUNTAINS
HEART OF THE NATION

KANSAS CITY
MISSOURI

CONTRACTOR AFFIDAVIT FOR FINAL PAYMENT

Project Number _____

Project Title _____

STATE OF _____)
)SS
COUNTY OF _____)

The Undersigned, _____ of lawful
(Name)
age, being first duly sworn, states under oath as follows:

1. I am the _____ of _____who is the general
(Title) (CONTRACTOR)
CONTRACTOR for the CITY on Project No. _____ and Project Title _____.

2. All payrolls, material bills, use of equipment and other indebtedness connected with the Work for this Project have been paid and all Claims of whatever nature have been satisfied, as required by the Contract.

3 (✓) ☐ Prevailing wage does not apply; or

(✓) ☐ All provisions and requirements set forth in Chapter 290, Section 290.210 through and including 290.340, Missouri Revised Statutes, pertaining to the payment of wages to workmen employed on public works projects have been fully satisfied and there has been no exception to the full and complete compliance with these provisions and requirements and the Annual Wage Order contained in the Contract in carrying out the Contract and Work. CONTRACTOR has fully complied with the requirements of the prevailing wage law as required in the Contract and has attached affidavits from all Subcontractors on this Project, regardless of tier, affirming compliance with the prevailing wage law as stipulated in the Contract.

4. I hereby certify that (a) at project completion and pursuant to contractor's final request for payment, contractor achieved (_____%) Minority Business Enterprise (MBE) participation and (_____%) Women Business Enterprise (WBE) participation on this contract, and (b) listed herein are the names of all certified M/WBE subcontractors, regardless of tier, with whom I, or my subcontractors contracted.

1. Name of MBE/WBE Firm _____
Address _____
_____
Telephone Number (_____) _____
IRS Number _____
Area/Scope*of Work _____
Subcontract Final Amount _____

2. Name of MBE/WBE Firm _____
Address _____
_____
Telephone Number (_____) _____
IRS Number _____
Area/Scope*of Work_____
Subcontract Final Amount _____

DocuSign Envelope ID: CF07562F-6A3B-4EF2-A92A-60C48F7AB190

List additional subcontractors, if any, on a similar form and attach to the bid.

Supplier** Final Amount: _____

*Reference to specification sections or bid item number.

(✓) ☐ Met or exceeded the Contract utilization goals; or
(✓) ☐ Failed to meet the Contract utilization goals (attach waiver, substitution or modification); or
(✓) ☐ No goals applied to this Project.

5. CONTRACTOR certifies that each Subcontractor has received full payment for its respective work in connection with the Contract.

6. If applicable, I hereby certify that (1) at project completion and pursuant to contractor's final request for payment, contractor achieved, company-wide, at least ten percent (10%) minority workforce participation and two percent (2%) women workforce participation and (2) a true and accurate copy of my final project workforce monthly report is attached. **NOTE: This paragraph is only applicable if you completed a construction contract that was estimated by the City, prior to solicitation, as requiring more than 800 construction labor hours and costing in excess of $300,000.00. If applicable you MUST attach copies of your final monthly workforce reports.**

7. This affidavit is made in behalf of the CONTRACTOR for the purpose of securing from Kansas City, Missouri, the certification of completion of the Project and receiving payment therefore.

8. If the Contract amount exceeded $150,000, CONTRACTOR has submitted proof of compliance with the City tax ordinances administered by the City's Commissioner of Revenue and has on file proof of tax compliance from all Subcontractors. If the Contract term exceeded one (1) year, CONTRACTOR has provided proof of compliance with the City tax ordinances administered by the City's Commissioner of Revenue prior to receiving final payment and has on file proof of tax compliance from all Subcontractors prior to the Subcontractor receiving final payment from CONTRACTOR.

CONTRACTOR_____

By _____
(Authorized Signature)

Title _____

On this _____ day of _____, _____, before me

appeared _____, to me personally known to be the

_____of the_____,

and who executed the foregoing instrument and acknowledged that (s)he executed the same on behalf of

_____ as its free act and deed.

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

My commission expires:

_____ _____
Notary Public

CITY OF FOUNTAINS
HEART OF THE NATION
KANSAS CITY
MISSOURI

SUBCONTRACTOR AFFIDAVIT FOR FINAL PAYMENT

Project/Contract Numbers 80002543/9911_____

Project Title Vertical Wells 2-5 Replacement_____

STATE OF MISSOURI)

) ss:

COUNTY OF _____)

After being duly sworn the person whose name and signature appears below hereby states under penalty of perjury that:

1. I am the duly authorized officer of the business indicated below (hereinafter Subcontractor) and I make this affidavit on behalf of Subcontractor in accordance with the requirements set forth in Section 290.290, RSMo. Subcontractor has completed all of the Work required under the terms and conditions of a subcontract as follows:

Subcontract with: _____, Contractor

Work Performed: _____

Total Dollar Amount of Subcontract and all Change Orders: $_____

City Certified ☐MBE ☐ WBE ☐ DBE ☐ NA
List certifications: _____

2. Subcontractor fully complied with the provisions and requirements of the Missouri Prevailing Wage Law set forth in Sections 290.210, RSMo through 290.340, RSMo.

Business Entity Type:
(___) Missouri Corporation
(___) Foreign Corporation
(___) Fictitious Name Corporation
(___) Sole Proprietor
(___) Limited Liability Company
(___) Partnership
(___) Joint Venture
(___) Other (Specify)

Subcontractor's Legal Name and Address

_____

_____
Phone No. _____
Fax: _____
E:mail:_____
Federal ID No._____

I hereby certify that I have the authority to execute this affidavit on behalf of Subcontractor.

By: _____ _____
(Signature) (Print Name)

_____ _____
(Title) (Date)

NOTARY

Subscribed and sworn to before me this _____ day of _____, 20_____.

My Commission Expires:_____ By_____

_____ _____
Print Name Title

CITY OF FOUNTAINS
HEART OF THE NATION

KANSAS CITY
MISSOURI

DAILY FIELD OBSERVATION REPORT

Project/Contract Numbers 80002543/9911

Project Title Vertical Wells 2-5 Replacement

Contractor _____

Report Number _____ Date _____ Time _____

Weather			Site Conditions		Day	
❑ Clear	❑ Snow	❑ Warm	❑ Clear	❑ Dusty	❑ Monday	❑ Thursday
❑ Overcast	❑ Foggy	❑ Hot	❑ Muddy	❑ _____	❑ Tuesday	❑ Friday
❑ Rain	❑ Cold	❑ Temperature Range _____			❑ Wednesday	❑ _____

Persons Contacted:

Work Observed:

Items Discussed:

Materials Delivered:

Requested Revisions or Interpretations:

Nonconforming Work Reported This Date To Contractor:

Remarks:

❑ Attachments

Signed by: Date:

Distribution:
- ❑ Owner
- ❑ Contractor
- ❑ Construction Manager
- ❑ Design Professional
- ❑ Consultant _____
- ❑ Other _____

CITY OF FOUNTAINS
HEART OF THE NATION

KANSAS CITY
MISSOURI

PERIODIC FIELD OBSERVATION REPORT

Project/Contract Numbers 80002543/9911

Project Title Vertical Wells 2-5 Replacement

Contractor _____

Report Number _____ Date _____ Time _____

Weather			Site Conditions		Day	
❑ Clear	❑ Snow	❑ Warm	❑ Clear	❑ Dusty	❑ Monday	❑ Thursday
❑ Overcast	❑ Foggy	❑ Hot	❑ Muddy	❑ _____	❑ Tuesday	❑ Friday
❑ Rain	❑ Cold	❑ Temperature Range _____			❑ Wednesday	❑ _____

Persons Contacted:

Work Observed:

Items Discussed:

Remarks:

❑ Attachments

Signed by: Date:

Distribution:
- ❑ Owner
- ❑ Contractor
- ❑ Construction Manager
- ❑ Design Professional
- ❑ Consultant _____
- ❑ Other _____

CITY OF FOUNTAINS
HEART OF THE NATION

KANSAS CITY
MISSOURI

WEEKLY REPORT OF WORKING DAYS

Project/Contract Numbers 80002543/9911

Project Title Vertical Wells 2-5 Replacement

Contractor _____

Report Number _____ Week Ending: _____

DATE:	WORKING DAY	REMARKS

TOTAL THIS WEEK	PREVIOUSLY	TOTAL TO DATE	WORKING DAYS IN CONTRACT	REMAINING OR OVERTIME

Signed by OWNER'S REPRESENTATIVE Date:

Signed by CONTRACTOR Date:

Distribution: ❑ OWNER ❑ CONTRACTOR ❑ Construction Manager ❑ Design Professional ❑ Consultant ❑ Other

CITY OF FOUNTAINS
HEART OF THE NATION

KANSAS CITY
MISSOURI

TRANSMITTAL LETTER

Project/Contract Numbers 80002543/9911

Project Title Vertical Wells 2-5 Replacement

Date _____

TO: _____

Re: _____

ATTN: _____

We are sending you ❑ Attached ❑ Under separate cover via _____ the following items:
❑ Shop Drawings ❑ Prints ❑ Drawings ❑ Samples ❑ Specifications
❑ Copy of Letter ❑ Change Order ❑ _____

Copies	Date	No.	Description

These are transmitted as checked below:

❑ For Approval ❑ Approved as Submitted ❑ Resubmit _____ Copies for Approval
❑ For Your Use ❑ Approved as Noted ❑ Submit _____ Copies for Distribution
❑ As Requested ❑ Returned for Corrections ❑ Return _____ Corrected Prints
❑ For Review and Comment ❑ _____

Remarks: _____

By: _____

Distribution:
❑ Owner
❑ Contractor
❑ Construction Manager
❑ Design Professional
❑ Consultant
❑ Other

CITY OF FOUNTAINS
HEART OF THE NATION

KANSAS CITY
MISSOURI

SUBSTITUTION REQUEST

Project Number _____

Project Title _____

To: _____ Authorization Number: _____
_____ From: _____
Re: _____ Date: _____
_____ Contract For: _____

Specification Title: _____
Section: _____ Page: _____ Article/Paragraph: _____

Proposed Substitution: _____
Manufacturer: _____ Address: _____ Phone No. _____
Trade Name: _____ Model No. _____
Installer: _____ Address: _____ Phone No. _____
History: ❑ New Product ❑ 2-5 years old ❑ 5-10 years old ❑ More than 10 years old
Differences between proposed substitution and specified product: _____
_____
_____

❑ Point-by-point comparative data attached – REQUIRED

Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance, service, and availability of replacement parts, as applicable, are available.
- Proposed substitution will not affect or delay Progress Schedule, except as stated below.
- Cost data as stated above is complete. Claims for additional costs related to accepted substitution which may subsequently become apparent are to be waived.
- Proposed substitution does not affect dimensions and functional clearances, except as stated below.
- Payment will be made for changes to building design, including architectural or engineering design, detailing, licenses, royalties, and construction costs caused by the requested substitution.
- Coordination, installation, and changes in the Work as necessary for accepted substitution will be completed in all respects.

Reason for not providing specified item: _____
_____
_____
_____

Similar Installation:
Project: _____ Design Professional: _____
Address: _____ Owner: _____
_____ Date Installed: _____
Proposed substitution affects other parts of Work: ❑ No ❑ Yes; explain _____
_____
_____

Savings to Owner for accepting substitution: _____
Proposed substitution changes Contract Time: ❑ No ❑ Yes; add/deduct _____ days.

Supporting Data Attached:
❑ Product Data ❑ Drawings ❑ Tests ❑ Reports ❑ Samples ❑ _____
Attachments: _____

Submitted by: _____
Signature: _____
Firm: _____
Address: _____

Telephone: _____ Fax: _____ E-Mail: _____

Additional Comments: ❑ Contractor ❑ Subcontractor ❑ Supplier ❑ Manufacturer ❑ DP ❑ _____

DESIGN PROFESSIONAL'S REVIEW AND ACTION

- ❑ Substitution approved – Make submittals in accordance with Specification Section 01300.
- ❑ Substitution approved as noted – Make submittals in accordance with Specification Section 01300.
- ❑ Substitution rejected – Use specified materials.
- ❑ Substitution Request received too late – Use specified materials.

Signed by: _____ Date: _____

Distribution:
- ❑ Owner
- ❑ Design Professional
- ❑ Contractor
- ❑ Consultant
- ❑ Construction Manager
- ❑ Other

SECTION 01015 - PROJECT REQUIREMENTS

PART 1 - GENERAL

1.1 GENERAL DESCRIPTION OF WORK.

A. The Work to be performed under these Contract Documents is generally described as follows:

1. Demolition of existing and replacement of existing Vertical Well Nos. 2, 3, 4, & 5 with new larger capacity vertical wells.

2. Demolition of existing and replacement piping and valves for the associated Vertical Well Nos. 2, 3, 4, & 5.

3. Provision of Vertical Wells programmable logic controller (PLC) and integration of PLC into existing SCADA system.

4. Electrical modifications within the existing Intake Pump Station.

1.2 UNITS OF MEASUREMENT.

A. Both inch-pound (English) and SI (metric) units of measurement are specified herein; the values expressed in inch-pound units shall govern.

1.3 OTHER CONSTRUCTION CONTRACTS – Not Used.

1.4 COORDINATION.

A. Contractor shall plan, schedule, and coordinate its operations in a manner which will facilitate the simultaneous progress of the work.

1.5 WORK BY PUBLIC UTILITIES, GOVERNMENTAL AGENCIES AND RAILROADS

A. Kansas City Missouri Water Services Department.

1. Contractor shall be responsible for coordinating and scheduling the work performed by Kansas City, Missouri Water Services Department (WSD) and shall furnish the service equipment required by WSD in support of the sewer connections in compliance with Kansas City, Missouri Water Services Department’s requirements and the Contract Documents.

B. Connections to existing facilities that are in service shall be planned a minimum of 30 days in advance, and all required equipment, materials and labor shall be available and be on the jobsite before the time of scheduling the connections. The Contractor shall verify the elevation, location, material of construction and outside diameter of existing pipelines and force mains prior to scheduling connections. The Contractor shall provide all equipment, material and labor required to adjust existing facilities so that all of the work is in compliance with current WSD Standards. Work shall proceed continuously (around the clock) if necessary to complete connections in the minimum time. Operation of valves or other appurtenances on existing utilities, when required, shall be by or under the direct supervision of WSD or owning utility.

C. Service interruption or temporary service is to be provided by the Contractor at their expense. The Contractor shall notify, 24 hours in advance, all plant services affected by the work of making connections as to the time of day and the span of time required to make said connections.

D. There should be no fees associated with the work performed by WSD.

1.6 COORDINATION OF WORK WITH OWNER

A. Owner shall perform certain activities in connection with the Project with its own personnel as follows:

1. Operation of the existing Vertical Wells, Intake Pump Station, and facilities within the Kansas City Water Treatment Plant,

2. Any operation of existing valves within the yard surrounding the Vertical Wells and Intake Pump Station.

1.7 PROCUREMENT CONTRACTS. Not Used.

1.8 ITEMS FURNISHED BY OWNER – Not Used

1.9 RESPONSIBILITY FOR MATERIALS AND EQUIPMENT

A. Items Furnished by Owner – Not Used.

B. Items Furnished by Contractor.

1. Contractor shall be fully responsible for all materials and equipment which it has furnished.

1.10 OFFSITE STORAGE.

A. Offsite storage arrangements shall be approved by Owner for all materials and equipment not incorporated into the Work but included in Applications for Payment. Such offsite storage arrangements shall be presented in writing and shall afford adequate and satisfactory security and protection. Offsite storage facilities shall be accessible to Owner and Engineer.

1.11 SUBSTITUTES AND "OR-EQUAL" ITEMS.

A. Whenever a material or article is specified or described by using the name of a proprietary product or the name of a particular manufacturer or vendor, the specified item shall be understood as establishing the type, function, and quality desired. Requests for review of equivalency will not be accepted from anyone except Contractor, and such requests will not be considered until after the Contract has been awarded. Other manufacturers' products may be accepted, provided sufficient information is submitted to allow Engineer to determine that the products proposed are equivalent to those named. Such items shall be submitted for review by the procedure set forth in the Submittals Procedures section.

1.12 PREPARATION FOR SHIPMENT.

A. All materials shall be suitably packaged to facilitate handling and protect against damage during transit and storage. Painted surfaces shall be protected against impact, abrasion, discoloration, and other damage. All painted surfaces which are damaged prior to acceptance of equipment shall be repainted to the satisfaction of Engineer.

B. Each item, package, or bundle of material shall be tagged or marked as identified in the delivery schedule or on the Shop Drawings. Complete packing lists and bills of material shall be included with each shipment.

1.13 SALVAGE OF MATERIALS AND EQUIPMENT.

A. Existing materials and equipment removed shall become Contractor's property.

B. Contractor shall carefully remove, in a manner to prevent damage, all materials and equipment specified or indicated to be salvaged or to remain the property of Owner. Contractor shall store and protect salvaged items .

C. Salvaged items to remain Owner's property shall be delivered by Contractor in good condition to Owner. Contractor shall coordinate location of salvaged items prior to the start of the Work.

D. Any items specified or indicated to be salvaged which are damaged in removal, storage, or handling through carelessness or improper procedures shall be replaced by Contractor in kind or with new items.

E. Existing materials and equipment removed by Contractor shall not be reused in the Work.

1.14 LAND FOR CONSTRUCTION PURPOSES.

A. Contractor will be permitted to use available land belonging to Owner, on or near the Site, for construction purposes and for storage of materials and equipment.

B. The locations and extent of the areas shall be as indicated on the Drawings.

C. Contractor shall immediately move stored materials or equipment if any occasion arises, as determined by Owner, requiring access to the storage area. Materials or equipment shall not be placed on the property of Owner until Owner has agreed to the location to be used for storage.

1.15 EASEMENTS AND RIGHTS-OF-WAY.

A. Contractor shall confine its construction operations within the limits indicated on the Drawings. Contractor shall use due care in placing construction tools, equipment, excavated materials, and pipeline materials and supplies in order to avoid damage to property and interference with traffic.

1.16 OPERATION OF EXISTING FACILITIES

A. The existing facilities must be kept in continuous operation throughout the construction period. No interruption will be permitted which adversely affects the degree of service provided. Provided permission is obtained from Owner in advance, portions of the existing facilities may be taken out of service for periods corresponding with periods of minimum service demands.

B. Contractor shall provide temporary facilities and make temporary modifications as necessary to keep the existing facilities in operation during the construction period. Refer to the Construction and Schedule Considerations Paragraph for descriptions of sequencing of the work.

C. Contractor shall perform work during critical connections and changeovers, and as required to minimize or prevent interruption of Owner’s operations.

D. When necessary, plan, design, and provide various temporary services, utilities, connections, temporary piping and heating, access and similar items to maintain continuous operations of Owner’s facility.

E. Contractor shall not close lines, open or close valves, or take other action which would affect the operation of existing systems, except as specifically required by the Contract Documents and after authorization by Owner and Engineer. Such authorization will be considered within 48 hours after receipt of Contractor’s written request.

1.17 NOTICES TO OWNERS AND AUTHORITIES

A. Contractor shall, as provided in the General Conditions, notify owners of adjacent property and utilities when execution of the Work may affect them.

B. When it is necessary to temporarily deny access to property, or when any utility service connection must be interrupted, Contractor shall give notices sufficiently in advance to enable the affected persons to provide for their needs. Notices shall conform to any applicable local ordinance and, whether delivered orally or in writing, shall include appropriate information concerning the interruption and instructions on how to limit inconvenience caused thereby.

C. Utilities and other concerned agencies shall be notified at least 24 hours prior to cutting or closing streets or other traffic areas or excavating near underground utilities or pole lines.

1.18 LINES AND GRADES

A. All Work shall be done to the lines, grades, and elevations indicated on the Drawings.

B. Basic horizontal and vertical control points are established within the drawings by the Engineer to be used as datums for the Work. All additional survey, layout, and measurement work shall be performed by Contractor as a part of the Work.

C. Contractor shall provide an experienced instrument person, competent assistants, and such instruments, tools, stakes, and other materials required to complete the survey, layout, and measurement work. In addition, Contractor shall furnish, without charge, competent persons and such tools, stakes, and other materials as Engineer may require in establishing or designating control points or in checking survey, layout, and measurement work performed by Contractor.

D. Contractor shall remove and reconstruct work which is improperly located.

1.19 ALLOWANCES – Not Used.

1.20 CONNECTIONS TO EXISTING FACILITIES

A. Unless otherwise specified or indicated, Contractor shall make all necessary connections to existing facilities, including structures, drain lines, and utilities such as water, sewer, gas, telephone, and electric. In each case, Contractor shall receive permission from Owner or the owning utility prior to undertaking connections. Contractor shall protect facilities against deleterious substances and damage.

B. Connections to existing facilities which are in service shall be thoroughly planned in advance, and all required equipment, materials, and labor shall be on hand at the time of undertaking the connections. Work shall proceed continuously (around the clock) if necessary to complete connections in the minimum time. Operation of valves or other

appurtenances on existing utilities, when required, shall be by or under the direct supervision of the owning utility.

1.21 UNFAVORABLE CONSTRUCTION CONDITIONS

A. During unfavorable weather, wet ground, or other unsuitable construction conditions, Contractor shall confine its operations to work which will not be affected adversely by such conditions. No portion of the Work shall be constructed under conditions which would affect adversely the quality or efficiency thereof, unless special means or precautions are taken by Contractor to perform the Work in a proper and satisfactory manner.

B. Contractor shall monitor Missouri River water levels and shall backfill any excavated areas to existing grade with approved materials. Work may resume when water levels have has decreased at a level suitable to meet the Permit.

1.22 NORTH KANSAS CITY LEVEE DISTRICT

A. The project is within the "critical zone: of the North Kansas City Levee District (NKCLD) levee and all excavation and backfill work must meet NKCLD and Corps of Engineers Requirements. Typically, excavation in the critical area is to be avoided between April 1 and August 1 of any year. However, NKCLD and the Corps of Engineers allow waivers to this restriction to be obtained from all periods not to exceed 30 days, provided antecedent construction and potential river stages are favorable.

B. High water conditions may occur while construction is in progress. The proposed work plan shall address all measures required to maintain the integrity of the levee during such periods. Contractor shall prepare a contingency plan addressing high water conditions for submittal. If a portion of the Work will take place during April 1 to August 1, Contractor will need to request a waiver in addition to preparing the contingency plan.

C. As part of the work, Contractor is responsible for monitoring Missouri River water levels. Owner has continuous recording river monitoring equipment at the site. Contractor shall make arrangements with Owner to monitor this data frequently while excavations are open. Additionally, if information is not available via the Owner, the nearby Missouri River gage reading can be use to gage the river level at this website: https://water.noaa.gov/gauges/kcdm7. If flood stages are forecasted on site, Contractor shall complete backfill of excavated areas and bulkheading of any drainage structures within 24 hours.

D. NKCLD and Corps of Engineers allow a contingency method which provides for stockpiling suitable material on site, and having the equipment and personnel to backfill any and all excavations upon rising river levels when the level is near the bottom of excavations. This is the method Contractor shall utilize on this project.

E. Contractor is to initiate emergency backfill of excavations immediately if directed by the North Kansas City Levee District or its representative.

F. Contractor shall prepare a contingency plan than includes as a minimum the following items:

1. Identification of a Flood Contingency Plan Coordinator.

2. Address emergencies backfill capabilities such as availability of adequate impervious fill material, type and availability of backfill equipment, and when emergency backfilling operations would be initiated during a flood period.

3. The location of the stockpile of the emergency fill on the site. (No stockpile material is allowed on the levee slopes or crown).

4. Excavation work should cease and backfilling start when the river level reaches a point 3 feet below the bottom of the excavation. The contingency plan should state that the rate of emergency backfill exceeds the rate of the rising river level.

5. The contingency plan should include all proposed measures to protect the area during the reduced level of protection due to construction activities.

6. The contingency plan should includes all material and equipment to be used to activate the plan.

7. The contingency plan shall consider the sheeting and shoring system developed on site.

G. Construction Records

1. Contractor shall submit to NKCLD compliance documentation for all materials and features to be in installed below grade and material in-place density testing.

2. Contractor shall notify the District within 14 calendar days that construction has been completed.

3. Contractor shall prepared and submit construction as-built record drawings to NKCLD within 90 days of the end of construction.

1.23 CUTTING AND PATCHING

A. As provided in General Conditions, Contractor shall perform all cutting and patching required for the Work and as may be necessary in connection with uncovering Work for inspection or for the correction of defective Work.

B. Contractor shall perform all cutting and patching required for and in connection with the Work, including but not limited to the following:

1. Removal of improperly timed Work.

2. Removal of samples of installed materials for testing.

3. Alteration of existing facilities.

4. Installation of new Work in existing facilities.

C. Contractor shall provide all shoring, bracing, supports, and protective devices necessary to safeguard all Work and existing facilities during cutting and patching operations. Contractor shall not undertake any cutting or demolition which may affect the structural stability of the Work or existing facilities without Engineer's concurrence.

D. Materials shall be cut and removed to the extent indicated on the Drawings or as required to complete the Work. Materials shall be removed in a careful manner, with no damage to adjacent facilities or materials. Materials which are not salvable shall be removed from the site by Contractor.

E. All Work and existing facilities affected by cutting operations shall be restored with new materials, or with salvaged materials acceptable to Engineer, to obtain a finished installation with the strength, appearance, and functional capacity required. If necessary, entire surfaces shall be patched and refinished.

1.24 CLEANING UP

A. Contractor shall keep the premises free at all times from accumulations of waste materials and rubbish.

B. Construction materials, such as concrete forms and scaffolding, shall be neatly stacked by Contractor when not in use. Contractor shall promptly remove splattered concrete, asphalt, oil, paint, corrosive liquids, and cleaning solutions from surfaces to prevent marring or other damage.

C. Volatile wastes shall be properly stored in covered metal containers and removed daily.

D. Wastes shall not be buried or burned on the Site or disposed of into storm drains, sanitary sewers, streams, or waterways. All wastes shall be removed from the Site and disposed of in a manner complying with local ordinances and antipollution laws.

E. Adequate cleanup will be a condition for recommendation of progress payment applications.

1.25 APPLICABLE CODES

A. References in the Contract Documents to local codes mean the following:

1. International Building Code, 2018 (with local amendments),

2. International Fire Code (2018),

3. National Electric Code 2017 (with local amendments),

4. International Mechanical Code 2018 (with local amendments),

5. Uniform Plumbing Code 2018 (with local amendments),

6. American Concrete Institute (with local amendments),

7. Manual of Traffic Control Devices (with local amendments).

8. International Energy Conservation Code 2021 (with local amendments).

9. NFPA 101 Life Safety Code 2018

10. Missouri Code of State of Regulations, Title 10, Division 23

11. Missouri Department of Natural Resources (MDNR) Minimum Design Standards for Missouri Community Water Systems, 2013

12. Applicable City Ordinances

13. Great Lakes – Upper Mississippi River Board of State and Provincial Public Health and Environmental Managers Recommended Standards for Water Works (Ten States Standards).

B. Other standard codes which apply to the Work are designated in the Specifications.

1.26 REFERENCE STANDARDS

A. 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 Contract or Agreement if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.

B. However, no provision of any referenced standard, specification, manual, or code, or any instruction of a Supplier, shall be effective to change the duties or 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 any such provision or instruction 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 performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the Contract Documents.

1.27 ALTERNATES – Not Used.

1.28 PRECONSTRUCTION CONFERENCE

A. Prior to the commencement of Work at the Site, a preconstruction conference will be held at a mutually agreed time and place. The conference shall be attended by:

1. Contractor and its superintendent.

2. Principal Subcontractors.

3. Representatives of principal Suppliers and manufacturers as appropriate.

4. Engineer and its Resident Project Representative.

5. Representatives of Owner.

6. Government representatives as appropriate.

7. Others as requested by Contractor, Owner, or Engineer..

B. Unless previously submitted to Engineer . Contractor shall bring to the conference a preliminary schedule for each of the following:

1. Progress Schedule.

2. Schedule of Values for progress payment purposes.

3. Schedule of Shop Drawings and other submittals.

C. The purpose of the conference is to designate responsible personnel and establish a working relationship. Matters requiring coordination will be discussed and procedures for handling such matters established. The agenda will include:

1. Contractor's preliminary schedules.

2. Transmittal, review, and distribution of Contractor's submittals.

3. Processing Applications for Payment.

4. Maintaining record documents.

5. Critical Work sequencing.

6. Field decisions and Change Orders.

7. Use of premises, office and storage areas, security, housekeeping, and Owner's needs.

8. Major equipment deliveries and priorities.

9. Contractor's assignments for safety and first aid.

D. Engineer will preside at the conference and will arrange for keeping the minutes and distributing the minutes to all persons in attendance.

1.29 PROGRESS MEETINGS

A. Contractor shall schedule and hold regular progress meetings at least monthly and at other times as requested by Engineer or required by progress of the Work. Contractor, Engineer, and all Subcontractors active on the Site shall be represented at each meeting. Contractor may at its discretion request attendance by representatives of its Suppliers, manufacturers, and other Subcontractors.

B. Contractor shall preside at the meetings. Meeting minutes shall be prepared and distributed by Contractor. The purpose of the meetings will be to review the progress of the Work, maintain coordination of efforts, discuss changes in scheduling, and resolve other problems which may develop.

1.30 SITE ADMINISTRATION

A. Contractor shall be responsible for all areas of the Site used by it and by all Subcontractors in the performance of the Work. Contractor shall exert full control over the actions of all employees and other persons with respect to the use and preservation of property and existing facilities, except such controls as may be specifically reserved to Owner or others.

B. Contractor shall have the right to exclude from the Site all persons who have no purpose related to the Work or its inspection, and may require all persons on the Site (except Owner's employees) to observe the same regulations as Contractor requires of its employees.

1.31 USE OF PREMISES.

A. Contractor shall limit site disturbance on the entire site including earthwork and clearing of vegetation.

1.32 COMMUNICATION PLAN

A. Prior to starting any work at the site, Contractor shall prepare a Communication Plan and submit the plan to the Owner for review and coordination. The plan shall include but not be limited to a listing of all Contractor, Subcontractor, Owner, and Engineer contacts and shall indicate primary and backup contacts. A copy of the final plan shall be distributed to all parties listed above and copy shall be kept at the site.

1.33 Site Safety

A. The Contractor shall be responsible for safety as described in the General Conditions and shall note the following safety issues in particular:

1. Contractor shall develop and implement a Fall Protection Plan using 100% fall protection in accordance with OSHA and all other applicable regulatory requirements. A copy of the plan shall be available at the site at all times during construction.

2. Contractor shall develop and implement a Trench Safety Plan in accordance with OSHA and all other applicable regulatory requirements. A copy of the plan shall be available at the site at all times during construction.

1.34 Work Plan

A. Contractor shall submit a work plan describing the proposed work. The work plan shall cover all major aspects of the construction, including but not limited to, critical sequencing, schedule, equipment to be used, and backup and contingency plans for out of service equipment. The work plan shall reference the communication and safety plans described above.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

End of Section

SECTION 01016 – SPECIAL SCHEDULING AND OPERATIONAL REQUIREMENTS

PART 1 - GENERAL

1.1 SCOPE

A. This section covers special scheduling and operational requirements for demolition, modification, and construction activities. The intent of these requirements is to ensure continuous service of the water treatment plant during performance of the demolition, modification, and construction work.

1.2 GENERAL

A. The conveyance capacity of the existing intake pump station and vertical wells to the KC Water Treatment plant must be maintained throughout the duration of the Work until the new vertical wells are operational and until startup and testing of the new vertical wells have been completed. No interruption will be permitted which adversely affects the degree of service provided, unless otherwise permitted by this section.

B. The Contractor shall provide to the Owner a schedule for all proposed construction activities as described in the Construction Scheduling section, including proposed downtime for all facilities affected by his operations. The Contractor shall obtain written permission from the Owner before any demolition or connections to existing facilities begin.

C. The Contractor shall provide temporary facilities and make temporary modifications as necessary to keep the existing facilities in operation during the construction period.

D. Unless otherwise specified or indicated, the Contractor shall make all necessary connections to existing facilities, including structures; drain lines; and utilities such as water and sewer. In each case, the Contractor shall receive permission from Owner prior to undertaking connections. The Contractor shall protect all facilities against deleterious substances and damage.

E. Connections to existing facilities which are in service shall be thoroughly planned in advance, and all required equipment, materials, and labor shall be on hand at the time of undertaking the connections. If required by the Owner, work shall proceed continuously (around the clock) if necessary to complete connections in the minimum time. Operation of valves or other appurtenances on existing utilities, when required, shall be by or under the direct supervision of the owning utility.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 INTERRUPTION OF SERVICE OF EXISTING FACILITIES

A. An outage shall be defined as any interruption of service to any portion of the Water Treatment Plant, including but not limited to the existing vertical wells, intake pump station, or raw water distribution mains; gravity and force main sewers; or potable water distribution, whether by shut down, diversion, or bypass.

B. Outage Plan

1. An outage and diversion plan, and requests for an outage, shall be prepared and submitted in addition to the construction schedule specified in the Construction Scheduling section. A detailed outage and diversion plan shall be submitted to Owner and Engineer a minimum of 60 calendar days in advance of the time that any such outage of facilities are required to perform the Work for review and acceptance.

2. The outage plan shall describe which operations will be impacted, the Contractor's method for preventing disruption, the length of time required to complete the Work, identifying provisions for dewatering and cleaning, temporary power and control requirements, and the manpower, and equipment which the Contractor shall provide in order to complete the Work and assure proper operation of the associated equipment. The plan shall be approved by the Owner before work may proceed and shall include the appropriate notification procedures. When necessary, Owner reserves the right to prevent the interruption of operation to facilities to occur at the time proposed by the Contractor.

C. Outage Operation

1. The Owner shall accept the outage and diversion plan prior to implementation of the diversion by the Contractor.

2. The Contractor shall complete work as quickly as possible and satisfactorily pass all tests, inspections, and repair all deficiencies.

3. The Contractor shall have all materials, equipment, and labor on the job site prior to starting an outage. The Contractor shall demonstrate that all temporary systems are in good working order and is sufficiently sized prior to beginning demolition modification work of the existing facilities.

3.2 SEQUENCE OF CONSTRUCTION

A. Generally, the demolition and construction work shall be performed within the limitations as follows.

B. Owner’s Use of Premise

1. The Owner reserves the right to occupy and to maintain equipment in the facility.

C. Work Sequence and Limitations of Construction

1. Construction sequence shall be determined by the Contractor, subject to Owner's needs for continuous operation of the existing facilities. Generally, the demolition and construction work shall be as scheduled by the Contractor and accepted by the Owner.

2. The Contractor shall incorporate the conditions and constraints of this section into the construction sequence. No attempt has been made to incorporate into this section all scheduling and sequencing provisions required to perform the Work.

3. The Contractor shall consider the sequence of the Work and constraints in removing existing facilities from service. Owner may consider other work sequences proposed by the Contractor if such sequences can be demonstrated to reduce the impact on the existing operations, to shorten the outage time of the facilities, and, in general, benefit the project.

4. No interruption of any existing facilities will be permitted that adversely affects the degree of service provided. Service interruptions may be restricted to specific times of day or seasonally so as to not impact facility performance. The Contractor shall work closely with Owner and Engineer in coordinating all service interruptions.

D. Temporary Facilities

1. Contractor shall provide temporary facilities and make temporary modifications as necessary to keep the existing facilities in operation during the construction period.

E. Operational Equipment

1. Equipment is deemed operational once it has been installed, checked, tested, and accepted per the requirements provided in the respective equipment sections and the Startup Requirements specification.

End of Section

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SECTION 01019 – Closeout Procedures

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
   1. Inspection procedures.
   2. Submittals.
   3. Final cleaning.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.
B. Related Sections include the following:
   1. Section 00700 – General Conditions.
   2. Section 01015 – Specific Project Requirements.
   3. Section 01020 – Record Documents.
   4. Section 01021 – Operation and Maintenance Data.
   5. Section 01140 – Work Restrictions.
   6. Section 01140.01 - Process and System Shutdown Constraints Schedule.
   7. Section 01140.02 - Operation Change Control Plan Documents.
   8. Section 01300 – Submittal.
   9. Section 01320 – Construction Progress Documentation.
   10. Section 01322 – Photographic Documentation
   11. Section 01335 – Document Management.
   12. Section 01340 – Building Information Modeling (BIM)
   13. Section 01433 – Manufacturers' Field Services
   14. Section 01664 – Training
   15. Section 01757 – Commissioning

1.03 SUBMITTALS

A. All Substantial Completion documents shall be submitted at least 14 calendar days prior to Substantial Completion inspection request.
   1. Specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
   2. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
   3. Prepare and submit Project Record Documents, final operation and maintenance manuals, Record Documents, damage or settlement surveys, property surveys, and similar final record information.
   4. Submit specific warranties, workmanship bonds, maintenance service agreements, and similar documents in accordance with this Section.
   5. Submit all manufacturers' certificates in accordance with Section 01433 Manufacturers' Field Services
   6. Submit Final Original Equipment Manufacturer Operations & Maintenance (OEM O&M) Manuals for all equipment and materials furnished as part of the Work of the Project.

7. Prepare and submit draft Facility O&M Data and the draft Electronic O&M Manual in accordance with the requirements of this Section.
8. Submit draft as-built BIM developed in accordance with Section 01340 Building Information Modeling Requirements and updated to include as-built conditions.
9. Submit training materials and recordings of training sessions as described in Section 01757 Commissioning.
10. Submit approved Acceptance Test Plan developed in accordance with Section 01757 Commissioning and with this Section.
11. Deliver tools, spare parts, extra material, and maintenance products in accordance with Section 01600 Product Delivery Storage and Handling.
12. Submit changeover information related to Owner's use, operation, and maintenance.
13. Prepare and submit draft Project Record Documents prepared in accordance with Section 01700 Execution Requirements and submitted in accordance with the requirements of this Section.

B. All Final Completion documents shall be submitted at least 14 calendar days prior to Final Completion inspection request. Before requesting a final inspection to determine the date of Final Completion, complete the following:
    1. Submit a certified copy of the City's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by the City. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
    2. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
    3. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Final operations and maintenance manuals must be provided for the training sessions.
    4. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects. Surfaces which cannot be touched-up or repaired satisfactorily, shall be refinished or replaced.
    5. Submit changeover information related to Owner's use, operation, and maintenance.
    6. Submit final O&M Data, including the final electronic O&M in accordance with the requirements of this Section.
    7. Submit Final Building Information Model incorporating all as-built information in accordance with Section 01340 Building Information Modeling Requirements.
    8. A written request for final inspection for acceptance requirements.
    9. Submit a final Application for Payment according to Division1 Section "Payment Procedures."

1.04 WARRANTIES

A. Submit written warranties on request of Engineer for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.
B. Partial Use: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and used by Owner during construction period by separate agreement with Contractor or Design-Builder.
C. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
    1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
    2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or

installation, including the name of the product and the name, address, and telephone number of Installer.
3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor or Design-Builder.

D. Provide additional copies of each warranty to include in operation and maintenance manuals.
E. Provide additional copies of each warranty as a separate pdf file.
F. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

1.05 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for determining the date of Substantial Completion, the Contractor or Design-Builder shall comply with all conditions in Supplementary Conditions and complete the following. List items below that are incomplete in request.
1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
2. Deliver salvaged material and similar items in accordance with Section 01352 Selective Alterations and Demolition to location designated by the Owner. Label with manufacturer's name and model number where applicable.
3. Complete Installation and Functional Testing of all equipment, systems and subsystems in accordance with Section 01757 Commissioning.
4. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems in accordance with Section 01757 Commissioning.
5. Clean the project area of construction debris and other construction effects.
6. Terminate and remove temporary facilities from the Project site, along with mockups, construction tools, and similar elements.
7. Complete final cleaning requirements, including touchup painting.
8. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
9. Prepare and submit all required Submittals as specified herein.

B. Inspection: Submit a written request for Substantial Completion inspection. On receipt of request, Engineer will either proceed with inspection or notify Contractor or Design-Builder of unfulfilled requirements. Engineer will prepare the Certificate of Substantial Completion after inspection or will notify Contractor or Design-Builder of items, either on Contractor or Design-Builder's list or additional items identified by Engineer that must be completed or corrected before certificate will be issued.
1. Request re-inspection when Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for Substantial Completion.
3. Contractor or Design-Builder shall pay for any re-inspection other than the first re-inspection. The costs of all extra re-inspections, including the cost of Owner’s Representative and Engineer will be deducted from the Contractor or Design-Builder’s payments.
4. Following completion of all items above and all requirements for Substantial Completion included in the Supplemental Conditions 008000, Owner will complete Form 01290.2 Certificate of Substantial Completion and distribute to Contractor or Design-Builder.

1.06 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final inspection for determining the date of Final Completion, complete the following:

1. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Final operations and maintenance manuals must be provided for the training sessions.
2. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects. Surfaces which cannot be touched-up or repaired satisfactorily, shall be refinished or replaced.
3. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects. Surfaces which cannot be touched-up or repaired satisfactorily, shall be refinished or replaced.
4. Prepare and submit all required Submittals as specified herein.

B. A written request for final inspection for acceptance must be provided to the Engineer. Upon receipt of request, Engineer will either proceed with inspection or notify Contractor or Design-Builder of unfulfilled requirements. Engineer will prepare a final Certificate for Payment after inspection or will notify Contractor or Design-Builder of construction that must be completed or corrected before certificate will be issued.
   1. Re-inspection: Request re-inspection when the Work identified in previous inspections as incomplete is completed or corrected. The Contractor or Design-Builder shall pay for any re-inspection other than the first re-inspection. The costs of all extra re-inspections, including the cost of the Owner's Representative and the Design Professional deducted from the Contractor or Design-Builder's payments.
   2. Submit a final Application for Payment according to Division 1 Section "Payment Procedures."

1.07 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Contractor or Design-Builder shall prepare and submit three copies of punch list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor or Design-Builder that are outside the limits of construction. The Contractor or Design-Builder shall use the standard Water Services form for all items.
   1. Organize a list of spaces in sequential order,
   2. Organize items applying to each space by major element, including category equipment, and building systems.
   3. Include the following information at the top of each page:
      a. Project Number
      b. Project name.
      c. Date.
      d. Name of Contractor or Design-Builder.
      e. Page number.

PART 2 - PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.01 FINAL CLEANING

A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with the manufacturer's written instructions.

C. Complete the following cleaning operations before requesting inspection for certification of Final Completion for entire Project or for a portion of Project:
    1. Clean Project site and grounds, in areas disturbed by construction activities, of rubbish, waste material, litter, and other foreign substances.
    2. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
    3. Remove tools, construction equipment, machinery, and surplus material from the Project site.
    4. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, and similar spaces.
    5. Sweep concrete floors broom clean in unoccupied spaces.
    6. Remove labels that are not permanent.
    7. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already shows evidence of repair or restoration.
D. Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
    1. Wipe surfaces of mechanical and electrical equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
    2. Clean ducts and blowers if units were operated without filters during construction.
    3. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
    4. Leave Project clean and ready for use.
E. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from the Project site and dispose of lawfully.

END OF SECTION

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SECTION 01020 – RECORD DOCUMENTS

PART 1 - GENERAL

1.01 SUMMARY

A. Contractor shall maintain, in a safe place at the Site, one updated record copy of all Drawings, Standards and Specifications, Addenda, Shop Drawings, Requests for Interpretation (RFIs), Requests for Proposal (RFPs), Work Change Directives (WCDs), Change Orders, other written interpretations or clarifications of the contract documents, survey information (including approved cut sheets) and all other documents relevant to the Work.
B. All such documents shall be kept in order, good condition and shall be continuously updated to indicate all work installed and all changes made during construction.
C. No work shall be allowed in the absence of these record documents.
D. This document also outlines electronic data requirements and defines the survey requirements for the development of Field-Marked Drawings, As-Built Drawings and Conforming to Construction Drawings.

1.02 RELATED SECTIONS

A. Section 00700 – General Conditions.
B. Section 01015 – Specific Project Requirements.
C. Section 01019 – Closeout Procedures.
D. Section 01020 – Record Documents.
E. Section 01021 – Operation and Maintenance Data.
F. Section 01140 – Work Restrictions.
G. Section 01140.01 - Process and System Shutdown Constraints Schedule.
H. Section 01140.02 - Operation Change Control Plan Documents.
I. Section 01300 – Submittals.
J. Section 01320 – Construction Progress Documentation.
K. Section 01322 – Photogram Documentation.
L. Section 01335 – Document Management.
M. Section 01340 – Project BIM Coordination
N. Section 01664 – Training.
O. Section 01757 – Commissioning.

1.03 CODES AND STANDARDS

A. CAD Standards – KC Water CAD Standards.

1.04 DEFINITIONS

A. Refer to Section 01420 – Definitions and Acronyms

1.05 INFORMATION PROVIDED BY THE CITY

A. The City will provide the Contractor or Design-Builder a border template to be used for all issued Construction Drawings in an electronic/CAD format.

1.06 SUBMITTALS

A. Submit as specified in Section 01300 – Submittals.
B. Warranties and Bonds.
C. For each item of material or equipment furnished under the Contract.
D. Submittals include, but are not limited to, the following:
    1. Warranties as specified herein.
    2. As-Built Drawings.
    3. Conforming to Construction Drawings.
    4. Electronic Submittals:
    5. All electronic deliverables (drawings, coordinates table, etc.) shall be made through the approved document management system. See Section 01335 – Document Management.
    6. As-Built Drawings:
        a. One (1) hard copy on paper for review and approval.
        b. One (1) electronic copy in PDF format.
        a. One (1) electronic copy in the latest version of AutoCAD® .dwg format.
    7. Conforming to Construction Drawings:
        a. One (1) signed, sealed and certified hard copy on Mylar or Vellum.
        b. One (1) signed, sealed and certified hard copy on paper.
        c. One (1) signed, sealed and certified electronic copy in PDF format.
        d. One (1) signed, sealed and certified electronic copy in the latest version of AutoCAD® .dwg format.
    8. All Record Documents including those listed in the referenced Sections:
        a. Submit Record documents in accordance with Section 00700 – General Conditions, Article 14 – Payments to the Contractor or Design-Builder and Completion.
        b. The following shall be submitted for Record Documents:
            i. One (1) hard copy on paper.
            ii. One (1) electronic copy in PDF format.
            iii. As specified in other sections.
            iv. Electronic (PDF) Documents:
            v. Documents shall be full scale.
            vi. Markups shall be noted in RED.
            vii. Minimum resolution shall be 600 dpi.

1.07 WARRANTY

A. Warranties and Bond are Record Documents.
B. CITY has the right to reject warranties.
C. CITY reserves the right to reject Work for the Project if the required warranties have not been provided.
D. Submit form of manufacturer's warranty prior to fabrication and shipment of the item from the manufacturer's facility.
E. Submit form of manufacturer's special warranty when specified.
F. Provide consolidated warranties and bonds within 15 calendar days of Substantial Completion.
G. Contents:
    1. Organize warranty and bond documents:
    2. Include Table of Contents organized by specification section number and the name of the product or work item.

3. Include each required warranty and bond in proper form, with full information, are certified manufacturer as required, and are properly executed by Contractor, or subcontractor, supplier, or manufacturer.
4. Provide name, address, phone number, and point of contact of manufacturer, supplier, and installer, as applicable.

H. Warranty submittal format:
1. Submit two (2) hardcopies.
2. Hardcopies shall be assembled in 3 D-side ring binders with durable cover.
3. Identify each binder on the front and spine clearly labeling the following:
   a. Warranties and Bonds.
   b. Project Name or Title.
   c. Name, Address, and Telephone Number of the Contractor.
4. Submit one (1) electronic copy in PDF format.
5. The Record Documents shall be an integral part of the work guaranteed by the Contractor or Design-Builder's Performance and Maintenance Bond. If during the three-year maintenance period the City determines that further revisions or corrections are necessary to make the Record Documents accurate, the Contractor or Design-Builder shall make or cause the revisions or corrections to be made at no additional cost to the City.

1.08 QUALITY ASSURANCE

A. The Contractor or Design-Builder is responsible for the quality assurance and quality control of the Work.

PART 2 – PRODUCTS – NOT USED

PART 3 – EXECUTION

3.01 SURVEY REQUIREMENTS

A. All field books, notes, videotapes and other data developed by the Contractor or Design-Builder in performing required surveys as part of the Work shall be available to the City for examination throughout the construction period. All such data shall be submitted to the City with the other documentation required for final acceptance of the Work.

B. General Requirements:
1. The Contractor or Design-Builder shall provide survey grade information for the locations and elevations of the Work as described herein. Surveys shall be conducted by a Professional Land Surveyor, licensed in the State of Missouri.
2. Vertical Datum – All elevations shall be indicated in North American Vertical Datum of 1988 (NAVD 88) in feet and decimals of a foot.
3. Horizontal Control – Coordinates shall be referenced to the North American Datum of 1983 (NAD 83), State Plane Missouri West Zone FIPS 2403 US Feet coordinate system, Kansas City Metro Control. Statewide Missouri Geographical Reference System monuments, Project monuments and Certified Land corners shall be used as references to determine State Plane coordinates. All control monuments used in the survey work shall be listed with reference ties and shown on the Record Drawings.

4. Water Systems:
    a. Fire Hydrant Assemblies – Provide survey point (location and elevation) at the top of the operating nut for each fire hydrant.
    b. Fittings – Provide survey point (location and elevation) at the center of each fitting (i.e. bends, tees, valves, etc.). Survey shall be taken at the top of the fitting. Provide the elevation of finished grade or improvements at the top of the fitting.
    c. Pipe Profile – Provide survey points (location and elevation) at the center point of all piping at a maximum spacing of 50 feet. Survey shall be taken on the top of the pipe. At the same location, provide the elevation of finished grade.
    d. Valves, Valve Vaults, Meter pits and Other Structures – A survey is required to verify the location of all new valves, valve vaults, meter pits or other structures. The survey shall include, but is not limited to, the following:
        (i) Location of the Structure – Provide coordinates for the center of the access cover.
        (ii) Top elevation – Provide the top elevation of the structure at the center of the access cover.
5. Wastewater Systems:
    a. Location – Verify the "Locating Point" shown on the Approved for Construction Drawings or standard detail. Verify all coordinate data shown on the Approved for Construction Drawings. If no such information is provided, the Locating Point shall be the center of the manhole cover.
    b. Top Elevation. – Provide the elevation of the top of the structure at the Locating Point.
    c. Pipe Inverts – Provide the invert elevation and flow direction of all pipes that penetrate the structure (flowline in - FL IN) and exit the structure (flowline out - FL OUT).
    d. Manhole Invert – Provide the elevation of the invert at the center of the manhole if different than the pipe inverts.
6. Existing Manholes – A survey is required to verify the location of all existing manholes that are modified as part of the Work. The survey shall include, but is not limited to, the following:
    a. Location of the Structure – Verify the "Locating Point" shown on the Approved for Construction Drawings or standard detail. Verify all coordinate data shown on the Approved for Construction Drawings. If no such information is provided, the Location Point shall be the center of the manhole cover.
    b. Top Elevation – Provide the elevation of the top of the structure at the Locating Point.
    c. Pipe Inverts – Provide the invert elevation and flow direction of all pipes that penetrate the structure (flowline in - FL IN) and exit the structure (flowline out - FL OUT).
    d. Manhole Invert – Provide the elevation of the invert at the center of the manhole if different from the pipe inverts.
7. Storm Water and Green Infrastructure Systems
    a. A survey is required to verify the location of all new Green Infrastructure, Storm Water Structures, Junction Boxes, Manholes, Inlets and all other related structures. The survey shall include, but is not limited to, the following:
    b. Location of the Structure – Verify the Locating Point shown on the Approved for Construction Drawings or standard detail. Verify all coordinate data shown on the Approved for Construction Drawings. The locating point for curb inlets is center of inside face of inlet wall. If no other locating information is provided for other structures, the Locating Point shall be the center of the access cover.
    c. Top Elevation – Provide the elevation of the top of the structure at the Locating Point.

d. Pipe Inverts – Provide the invert elevation and flow direction of all pipes that penetrate the structure (flowline in - FL IN) and exit the structure (flowline out - FL OUT).
e. Manhole or Structure Invert – Provide the elevation of the invert at the center of the manhole or structure if different than the pipe inverts.

8. Culvert - A survey is required to verify the location of new culverts. The survey shall include, but is not limited to, the following:
   a. Location – The Locating Points shall be the center line of each culvert barrel at the upstream and downstream end of each. The location of each culvert barrel is to be provided.
   b. Invert – Provide the upstream and downstream invert elevation of each culvert barrel.
9. Channels and Ditches:
   a. Profile – Provide survey points (location and elevation) at the upstream and downstream end of the channel and along the channel at a maximum 50-foot intervals and at all bends and changes in alignment.
   b. Survey points shall be taken at finished grade at the centerline, toes of side slopes or walls and top elevation of the high flow channel on both sides of the channel. If water is present in the channel or ditch, provide water surface elevation on both sides of the channel.
10. Detention Areas:
   a. For any surface feature designed to detain or retain storm water runoff (i.e., detention basins, rain gardens, bio-retention cells, etc.) an as-built survey of the feature is required.
   b. Enough survey points shall be taken to generate 1-foot contours of the detention or retention area and any containment berms.
   c. Provide survey points (location and elevation) for both ends of weirs, all weir high and low points (if top of weir is not level) and other flow control structures, inlets and outlets.
   d. Provide survey points (location and elevation) for both ends of weirs and all weir high and low points (if top of weir is not level) of the principle spillway structure.
11. Facility Site Assets:
   a. Site Assets shall be documented to the same level of detail as other assets (water, wastewater etc..).
   b. Assets include all buried infrastructure in the project including but not limited to ductbanks, conduit, chemical piping, casings, gravity sewers, process piping, etc.

3.02 FIELD-MARKED DRAWINGS

A. The Contractor or Design-Builder shall continuously maintain a set of Field-Marked Drawings which details all work completed and shows all changes or deviations made by the Contractor or Design-Builder from the Approved for Construction Drawings. Where the Approved for Construction Drawings are not detailed and allow for flexibility during construction, the Contractor or Design-Builder shall include the detailed information on how the Work was constructed. These adjustments shall include, but are not limited to, field adjustments and change orders.
B. Field-Marked Drawings shall be prepared using survey grade information to show the horizontal and vertical location of the Work after completion of construction. Connection details may be sketched using field run measurements.
C. Mark new information that is not shown on Drawings or Shop Drawings.

D. Include the following:
   a. Field changes of dimension and detail.
   b. Change Order modification. Note related Change Order numbers where applicable.
   c. RFI modification. Note related RFI numbers where applicable.

d. Details not on original Drawings.
e. Horizontal and vertical location of all underground utilities and all other concealed elements that would be difficult or costly to maintain the installed asset long term.

E. Precision of Measurement:
   a. Where survey measurements are not required (sketching connection details) – elevations, stationing, distances and measurements shall be expressed to the nearest 0.10 foot.
   b. All other Work requires survey information – elevations, station, distances and measurements shall be expressed to the nearest 0.01 foot.
   c. Field changes or additions shall be designated in RED. Hard copy and electronic (PDF) deliverables shall be provided in color.
   d. Information shall be clearly distinguishable on hard copy mark-ups and in the electronic files.

F. If the Contractor or Design-Builder observes inaccurate information pertaining to existing conditions, the correct information shall be noted in the Field-Marked Drawings.

G. The Contractor or Design-Builder shall submit 30%, 60% and 90% check prints with the corresponding percent complete of work. The check prints shall be submitted with the Application for Payment. Failure to provide the check prints shall cause the Application for Payment to be returned to the Contractor or Design-Builder.

3.03 AS-BUILT DRAWINGS

A. Upon completion of the Work and before the Application for Final Payment, the Contractor or Design-Builder shall prepare the As-Built Drawings by completing annotations to the Field-Marked Drawings and adding the required certification statements.

B. Surveyor's Certification:
   1. Each drawing shall be modified to include a certification statement and signature block as described below.
      a. Water Systems

         Each sheet of these Record Drawings and attached Survey Cut Sheets for the Work have been reviewed and approved by the Professional Land Surveyor whose seal is affixed to this Record. The horizontal control, coordinates and elevations shown on these Records are accurate and are based on the Missouri Coordinate System of 1983, West Zone and NAVD88 datum, with the date of adjustment. These Records have been revised, as required in Section 01000, 1.20 of the Standards and Specifications for Water Main Extensions and Relocations, under my personal supervision to show the true and accurate measurements of the work as it was actually constructed.

      b. Wastewater, Storm Water and Green Infrastructure Systems

         Each sheet of these Record Drawings, Record Models and attached Survey Cut Sheets for the Work have been reviewed and approved by the Professional Land Surveyor whose seal is affixed to this Record. The horizontal control coordinates and elevations shown on these Records are accurate and are based on the Missouri Coordinate System of 1983, West Zone and NAVD88 Datum. These Records have been revised under my personal supervision to show the true and accurate measurements of the work as it was actually constructed.

2. Every sheet of the Field-Marked Drawings must be reviewed, signed and sealed by a Professional Land Surveyor, licensed in the State of Missouri and must include the following statement on the title block inside the box marked “for WSD use” and near the Surveyor’s professional license seal.

C. Contractor’s Certification:
1. Each drawing shall be modified to include a certification statement and signature block as described below:

Water Systems

I hereby certify that this Record correctly depicts the Work constructed as to size, material, horizontal location, vertical location and finished grade as shown on the approved construction drawings or their revision. The Work was done in accordance with these Records and the current version of the Standards and Specifications for Water Main Extensions and Relocations.

Contractor: _____ *Date:* _____

Name (print): _____ *Title:* _____

Signature: _____

Wastewater, Storm Water and Green Infrastructure Systems

I hereby certify that this Record correctly depicts the Work constructed as to size, material, horizontal location, vertical location, grade of installed piping systems and finished grade as shown on the approved construction drawings or their revision. The Work was done in accordance with these Records.

Contractor: _____ *Date:* _____

Name (print): _____ *Title:* _____

Signature: _____

a. The Contractor or Design-Builder shall provide certification that the Field-Marked Drawings reflect the conditions that were constructed.
b. The Contractor or Design-Builder shall review the Field-Marked Drawings and verify all information is accurate. The Contractor or Design-Builder shall verify that all changes to the Work have been documented. The Contractor or Design-Builder shall sign each sheet of the Record Drawings with the following certification(s):

D. Submittals – Submit As-Built Drawings in accordance with paragraph SUBMITTALS. As-Built and Conforming to Construction Drawings must be approved by the City before the Contractor or Design-Builder submits the Application for Final Payment.
1. Mark each document "AS-BUILT DRAWINGS" in neat, large print letters.
2. The cover sheet of the project shall be included. The cover sheet shall include all required As-Built certifications and shall clearly show that the drawings are AS-BUILT.

3.05 RECORD MODEL

A. BIM model of the structure constructed or modified during this project.
B. Record Model should be per KC BIM standards with Record documents and drawings linked.

C. All BIM files and associated files shall be tagged according to Record File Standard.

3.06 CONFORMING TO CONSTRUCTION DRAWINGS AND MODEL

A. Conforming to Construction Drawings shall be submitted and accepted by the City before the Contractor or Design-Builder may submit the Application for Final Payment.
B. The Contractor or Design-Builder shall edit the CAD drawings to reflect the changes shown on the As-Built Drawings. All line work and text shall be revised and edited to accurately reflect the information provided in the As-Built Drawings. Line work shall be drawn to scale in the coordinate system and datum specified herein.
C. Version – CAD drawings shall be developed and submitted in the latest version of AutoCAD® .dwg format or AutoCAD® Civil 3D.
D. CAD Standards – Comply with KC Water CAD Standards.
E. GIS Standards – Comply with KC Water GIS Standards.
F. The cover sheet of the project shall be included. The cover sheet shall include all required as-built certifications and shall clearly show that the drawings are as-built.
G. Conforming to Construction Drawings shall have a "CONFORMED TO CONSTRUCTION" label clearly and prominently shown on each sheet, preferably in the lower right-hand corner of the drawing.
H. Conforming to Construction Drawings shall be labeled with the following information:
    1. Project Name.
    2. WSD Project Number.
    3. WSD Work Order Number.
    4. WSD Drawing Number.
    5. CMMS Assets.
    6. Date of publication.

3.07 OTHER RECORD DOCUMENTS

A. As defined by Section 00700 – General Conditions, Article 6 – Contractor or Design-Builder's Responsibilities. Section 01021 – Operation and Maintenance Data, Section 01300 –Submittals, Section 01320 – Construction Progress Documentation, Section 01322 – Photographic Documentation, Section 01664 – Training, Section 01757 – Commissioning, etc…
B. GIS Data of Site Piping.
C. Coordinates Table – Provide a Microsoft Excel spreadsheet that contains the coordinates of every asset installed or adjusted as part of the Work.
D. Survey Cut Sheets.
E. Television Inspection data files as specified in Section 02686 – CCTV Inspection.

END OF SECTION

SECTION 01021 – OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes administrative and procedural requirements for the preparation, submission, and City's Representative's review of Operation and Maintenance (O&M) Data.

1. The Contractor or Design-Builder shall furnish all labor, materials, equipment, and incidentals as necessary to comply with these requirements.

1.02 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract; including General and Supplementary Conditions, all applicable Division 1 Sections, and all applicable Division Sections; apply to this Section.

B. Related Sections include the following:

1. Section 01019 – Closeout Procedures
2. Section 01020 – Record Documents
3. Section 01140 – Work Restrictions
4. Section 01140.01 - Process and System Shutdown Constraints Schedule
5. Section 01140.02 - Operation Change Control Plan Documents
6. Section 01020 – Record Documents
7. Section 01300 –Submittals
8. Section 01320 – Construction Progress Documentation
9. Section 01322 – Photogram Documentation
10. Section 01335 – Document Management
11. Section 01664 – Training
12. Section 01757 – Commissioning

1.03 REQUIRMENTS

A. Contractor shall prepare and provide data and materials, and provide instruction and services, as specified in this Section.

B. Compile product data and related information appropriate for Owner's maintenance and operation of products and systems furnished under this Contract. Include Information on all motors supplied with equipment.

C. Prepare O&M Data as specified in this Section and as referenced in other pertinent sections of the Specifications.

D. Instruct Owner's personnel in maintenance of products and in operation of equipment and systems, including electrical and instrumentation.

1.04 DEFINITIONS

A. O&M Data is including but not limited to:

1. Original Equipment Manufacturer Operation and Maintenance manuals.
2. Electronic O&M Manual for the entire project.
3. PLC, VFD, and SCADA Server Programs.

B. Preliminary Data: Initial and subsequent submissions for the City's Representative's review.

C. Final Data: City's Representative accepted data, submitted as specified herein.

D. Maintenance Operation: As used on Asset Maintenance Summary Form is defined to mean any routine operation required to ensure satisfactory performance and longevity of equipment. Examples of typical maintenance operations are lubrication, belt tensioning, adjustment of pump packing glands, and routine adjustments.

1.05 SUBMITTALS

A. Informational:

1. Data Outline: Submit two copies of a detailed outline of proposed organization and contents of Final Data prior to the preparation of the Preliminary Data.

2. Preliminary Data:
   a. Submit three copies for City's Representative's review including Relevant Standard Operation Procedures and Standard Instructions.
   b. If Data meets the condition of the Contract:
      (1) One copy will be returned to Contractor or Design-Builder.
      (2) One copy will be forwarded to Resident Project Representative.
      (3) One copy will be retained in City's Representative's file.
   c. If Data does not meet the condition of the Contract:
      (1) All copies will be returned to Contractor or Design-Builder with City's Representative's comments (on separate document) for revision.
      (2) City's Representatives comments will be retained in City's Representative's file.
      (3) Resubmit two copies revised in accordance with City's Representative's comments.

1.06 SEQUENCING AND SCHEDULING

A. Equipment and System Data:

1. Preliminary Data:
   a. Do not submit until Shop Drawings for equipment or system has been reviewed and approved by City's Representative.
   b. Submit prior to shipment.

2. Final Data: Submit instructional Manual Formatted data not less than 30 days prior to equipment or system field functional testing Submit Compilation Formatted and Electronic Media Formatted data prior to Substantial Completion of Project.

B. Materials and Finish Data:

1. Preliminary Data: Submit at least 15 days prior to request for final inspection.

2. Final Data: Submit within 10 calendar days after final inspection.

PART 2 - PRODUCTS

2.01 DATA FORMAT (for Original Equipment Manufacture Operations and Maintenance Manuals OEM O&Ms)

A. Prepare preliminary and final data in the form of an instructional manual. Prepare final data on electronic media and printed.

B. Instructional Manual Format:

1. Binder: Commercial quality, permanent, three ring or three post binder with durable plastic cover.
2. Size: 8 ½ inches by 11 inches minimum.
3. Cover: Identify manual with typed or printed title, "(relevant area) OPERATION AND MAINTENANCE MANUAL" and list.
   a. Project title.
   b. Designate applicable system, equipment, material, or finish.
   c. Identify the assets covered in this O&M Manual.
   d. Identify separate structure as applicable.
   e. Identify volume number if more than one volume.
   f. Identify of general subject matter covered in manual. Identity of equipment number and Specification section.
4. Spine:
   a. Project Title.
   b. Volume number (if more than one volume).
5. Title Page:
   a. Contractor name, address, and telephone number.
   b. Subcontractor, supplier, installer, or maintenance Contractor or Design-Builder's name, address, and telephone number, as appropriate.
      (1) Identify area of responsibility of each.
      (2) Provide name and telephone number of local source of supply of parts and replacement.
6. Table of Contents:
   a. Neatly typewritten and arranged in systematic order with consecutive page numbers.
   b. Identify each product by product name and other identifying numbers or symbols as set forth in Contract Documents.
7. Paper: 20 pound minimum, white for typed pages.
8. Text: Manufacturer's printed data, or neatly typewritten.
9. Three-hole punch data for binding and composition.
10. Material shall be suitable for reproduction, with quality equal to original. Photocopying of material will be acceptable, except for material containing photographs.

C. Data Compilation Format:

1. Compile all City's Representative's accepted preliminary O&M data into a hard copy, hard bound set.
2. Each set shall consist of the following:
   a. Binder: Commercial quality, permanent, three ring or three post binders with durable plastic covers.

b. Cover: Identify each volume with typed and printed title "OPERATION AND MAINTENANCE DATA, VOLUME NO. _____ OF _____", and list:
   (1) Project Title
   (2) Contractor's name, address, and telephone number.
   (3) If entire volume covers equipment or system provided by one supplier include the following:
      (a) Identity of general subject matter covered in manual.
      (b) Identity of equipment number and Specification section.
c. Provide each volume with title page and typed table of contents with consecutive page numbers. Place contents of entire set, identified by volume number, in each binder.
d. Table of contents neatly typewritten, arranged in a systematic order:
   (1) Include list of each product, indexed to content of each volume.
   (2) Designate system or equipment for which it is intended.
   (3) Identify each product by product name and other identifying numbers or symbols as set forth in Contract Documents.
e. Section Dividers:
   (1) Heavy, 80 pound cover weight, tabbed with numbered plastic index tabs.
   (2) Fly leaf:
      (a) For each separate product, or each piece of operating equipment, with typed description of product and major component parts of equipment.
      (b) List with each product:
         (i) Name, address, and telephone number of Sub-contractor, Supplier, Installer, and Maintenance Contractor or Design-Builder, as appropriate.
         (ii) Identify area of responsibility of each.
         (iii) Provide local source of supply for parts and replacement.
f. Assemble and bind material, as much as possible, in same order as specified in the Contract Documents.

D. Electronic Media Data:

1. Portable Document Format (PDF):
   a. After all preliminary data has been found to be acceptable to City's Representative, submit Operation and Maintenance data in PDF format on CD.
   b. Files to be exact duplicates of City's Representative's accepted preliminary data. Arrange by specification number, asset, and name.
   c. Files to be fully functional and viewable in most recent version of Adobe Acrobat.
   d. PDFs shall be bookmarked as appropriate with appropriate hyperlinks.
   e. All files shall be tagged per the City's Record File tagging system.

E. DATA FOR EQUIPMENT SYSTEMS (Original Equipment Manufacturer Operations and Maintenance Manuals OEM O&Ms):

1. Content for each Unit (or Common Units) and System:

2. Product Data:
   a. Include only those sheets that are pertinent to specific product.
   b. Clearly annotate each sheet to:
      (1) Identify specific product or part installed.
      (2) Identify data applicable to installation.

(3) Delete references to inapplicable information.

c. Function, normal operating characteristics, and limiting conditions.

d. Performance curves, engineering data, nameplate data, and tests.

e. Complete nomenclature and commercial number of replaceable parts.

f. Original manufacturer's parts list, illustrations, detailed assembly drawings showing each part with part numbers and sequentially numbered parts list, and diagrams required for maintenance.

g. Spare parts ordering instructions.

h. Where applicable, identify installed spares and other provisions for future work (e.g., reserved panel space, unused components, wiring, terminals).

3. As installed, color coded piping diagrams.

4. Charts of valve tag numbers, with the location and function of each valve.

5. Drawings: Supplement product data with drawings as necessary to clearly illustrate:

a. Format:

(1) Provide reinforced, punched, binder tab; bind in with text.

(2) Reduced to 8 ½ inches by 11 inches, or 11 inches by 17 inches folded to 8 ½ inches by 11 inches.

(3) Where reduction is impractical, fold and place in 8 ½ inch by 11 inch envelopes bound in text.

(4) Identify Specification section and product on drawings and envelopes.

b. Relations of component parts of equipment and systems.

c. Control and flow diagrams.

d. Coordinate drawings with Project record documents to assure correct illustration of completed installation.

6. Instructions and procedures: Within text, as required to supplement product data.

a. Format:

(1) Organize in consistent format under separate heading for each different procedure.

(2) Provide logical sequence of instructions for each procedure.

(3) Provide information sheet for Owner's personnel, including:

(a) Proper procedures in event of failure.

(b) Instances that might affect validity of guarantee or Bond.

b. Installation Instructions: Including alignment, adjusting, calibrating, and checking.

c. Operating Procedures:

(1) Startup, break-in, routine, and normal operating instructions.

(2) Test procedures and results of factory tests where required.

(3) Regulation, control, stopping, and emergency instructions.

(4) Description of operation sequence by control manufacturer.

(5) Shutdown instructions for both short and extended duration.

(6) Summer and winter operating instructions, as applicable.

(7) Safety precautions.

(8) Special operating instructions.

d. Maintenance and Overhaul Procedure:

(1) Routine maintenance.

(2) Guide to troubleshooting.

(3) Disassembly, removal, repair, reinstallation, and re-assembly.
(4) Recommended work orders for preventative maintenance.

7. Guarantee, Bond, and Service Agreement: In accordance with section 01770, "Closeout Procedures".

8. Standard Operating Procedures and Standard Instructions for each unit process in KCMO Water Services Format approved by the KCMO City's Representative and Utility and created by the engineer of record or an alternative acceptable to the KCMO City's Representative.

9. Assets covered in this document.

F. Content for each Electric or Electronic Item or System:

1. Description of Unit and Component Parts:
   a. Function, normal operating characteristics, and limiting conditions.
   b. Performance curves, engineering data, nameplate data, and tests.
   c. Complete nomenclature and commercial number of replaceable parts.
   d. Interconnection wiring diagrams, including control and lighting systems.
   e. Piping and Instrumentation Diagram of the unit.

2. Circuit Directories of Panelboards.

3. Electrical service.

4. Control requirements and interface.

5. Communication requirements and interfaces.

6. List of electrical relay settings, and control and alarm contact settings.

7. Electrical interconnection wiring diagram, including as applicable, single line, three line, schematic and internal wiring, tags per KCMO tagging standard and external interconnection wiring.

8. As installed control diagrams by control manufacturer.

9. Operating Procedures:
   a. Routine and normal operating instructions.
   b. Startup and shutdown sequences, normal, and emergency.
   c. Safety precautions.
   d. Special operating instructions.

10. Maintenance Procedures:
    a. Routine maintenance.
    b. Guide to troubleshooting.
    c. Adjustment and checking.
    d. List of relay settings, control, and alarm contact settings.
    e. Preventative Maintenance.

11. Manufacturer's printed operating and maintenance instructions.

12. List or original manufacturer's spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage.

G. Maintenance Summary:

1. Complete individual Maintenance Summary for each applicable equipment item, respective unit or system, and for components or sub-units.

2. The Maintenance Summary form shall be updated to incorporate the final recommendations established through the Maintenance Workshops described in Section 01320 Construction Progress Documentation.

3. Format:
   a. Use Maintenance Summary Form bound with this section or electronic facsimile of such.
   b. Each Maintenance Summary may take as many pages as required.
   c. Use only 8 ½ inch by 11 inch size paper.
   d. Complete using typewritten or electronic printing.

4. Include detailed lubrication instructions and diagrams showing points to be greased or oiled; recommended type, grade, and temperature range of lubricants and frequency of lubrication.

5. Recommended Spare Parts:
   a. Data to be consistent with manufacturer's Bill of Materials/Parts List furnished in O&M manuals.
   b. "Unit" is the unit of measure for ordering the part.
   c. "Quantity" is the number of units recommended.
   d. "Unit Cost" is the current purchase price.

H. The type and quantity of spare parts provided shall be consistent with Criticality Workshops and failure mode and effects analysis (FMEA) process FMEA process as described in Section 01320 Construction Progress Documentation.

2.02 DATA FOR MATERIALS AND FINISHES

A. Content for Architectural Products, Applied Materials, and Finishes:

1. Manufacturer's data, giving full information on products:
   a. Catalog number, size, and composition.
   b. Color and texture designations.
   c. Information required for reordering special manufactured products.
2. Instructions for Care and Maintenance:
   a. Manufacturer's recommendation for types of cleaning agents and methods.
   b. Cautions against cleaning agents and methods that are detrimental to product.
   c. Recommended schedule for cleaning and maintenance.

B. Content for Moisture and Weather Exposed Products:

1. Manufacturer's data, giving full information on products:
   a. Applicable standards.
   b. Chemical composition.
   c. Details of installation.
2. Instructions for inspection, maintenance, and repair.

2.03 ELECTRONIC O&M MANUAL (E-O&M)

A. Contractor or Design-Builder shall provide a project specific Electronic O&M manual (e-O&M), which shall supplement the OEM O&M described. E-O&M shall contain the following information and functionalities:

1. Images (Photographic or digitally rendered) of the facility shall be provided in a "main screen" location, with specific facilities and systems labeled with all relevant names including but not limited to common names, CMMS tag and P&ID tags.
2. Overall and Major system descriptions as provided in the O&M manual.
3. Control Narratives for the overall project and individual systems/subsystems.
4. SOPs and SIs created by the Engineer of Record.
5. Record Photographs providing a document of the construction progress, as well as buried/hidden piping, conduits, foundations, and other infrastructure not readily located after construction work at the facilities is complete.
6. Manufacturer's shop drawings and O&M documents.
7. BIM of the assets.
8. Arc Flash Study.
9. Load Study.
10. Testing Results as identified in other Sections.
11. GIS records for the project.
12. As-Constructed/Record drawings and BIM of the completed facility.
13. Final Submittals for all project components.
14. Video recorded training organized by asset.
15. All system-specific information shall be organized into accessible files tied to each system. Access shall be through a written and/or graphic interface at the main screen.

B. All files submitted as part of the E-O&M shall be tagged per the Record File Standard.

C. PDF shall be bookmarked and hyperlinked.

D. E-O&M will operate through adobe acrobat software unless Contractor or Design-Builder provides an alternative application that is accepted in writing by the City of Kansas City, MO.

E. A draft version of the e-O&M will be provided to the city for review and comment at approximately 70% completion of the facility.

F. E-O&M will be installed at/on the project facility server or workstation(s) as appropriate, and a copy will be provided to the CITY.

G. Contractor will provide training on the use and update of the e-O&M to CITY. One training session lasting no longer than two (2) hours will be provided at the project location, Water Services offices, or Contractor or Design-Builders officers, as agreed-upon by the CITY.

H. All source files to the electronic O&M manual will be linked to the as-built BIM model by relevant asset, Items relevant to multiple assets will have multiple links.

I. Complete a short-circuit device coordination and arc flash study computer model developed in SKM.

J. Update SKM load study provided by the Owner.

K. Complete Asset/CMMS data:

1. Owner will provide a template for machine reading assets and maintenance activities into the Owner's Computerized Maintenance Management System (CMMS).

2. Access database template will be blank with fields for assets information such as asset additions, asset updates, asset retirements including a rough estimated value, maintenance activities for the assets, PID tags within the asset, and asset categorization.

3. Contractor or Design-Builder shall fill out the template documenting changes in the CMMS; insert asset additions including value, updates and retired assets including estimated value when taken out of service; work order updates; new PMs; PMs to be retired; non-destructive testing updates; and other asset fields. Assets shall be coordinated and categorized with the applicable CMMS takes for entry into Owner's CMMS and Financial Software.

2.04 PROGRAMS

A. PLC, VFD, and SCADA Programs: Provide current native format copies of all software programs used to control assets.

1. Files should be named per asset equipment IDs, systems, or sub systems as appropriate.

2.05 SUPPLEMENTS

A. The supplements listed below, following "End of Section", are part of this Specification.

1. Forms: Asset Maintenance Summary Form.

PART 3 - EXECUTION (NOT USED)

END OF SECTION

ASSET MAINTENANCE SUMMARY FORM

PROJECT _____ CONTRACT NO _____

KCMO CMMS TAG _____

EQUIPMENT ITEM _____

MANUFACTURER _____

PID/TAG NUMBERS _____

WEIGHT OF INDIVIDUAL COMPONENTS (OVER 100 POUNDS) _____

NAMEPLATE DATA (hp, voltage, speed, etc.) _____

MANUFACTURER'S LOCAL REPRESENTATIVE _____

Name _____ Telephone Number _____

Address _____

MAINTENANCE REQUIREMENTS

Maintenance Operation Comments	Frequency	Lubricant (if applicable)
List briefly each maintenance operation required and refer to specific information in manufacturer's standard maintenance manual, if applicable. (Reference to manufacturer's catalog or sales literature is not acceptable)	List required frequency of each maintenance operation	Refer by symbol to lubricant required

LUBRICANTS

Reference Symbol	Shell	Exxon Mobil	Chevron Texaco	BP Amoco	or Equal

RECOMMENDED SPARE PARTS FOR OWNER'S INVENTORY

Part Number	Description	Unit	Quantity	Unit Cost
Note: Identify parts provided by this contract with two asterisks				

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SECTION 01070 - ABBREVIATIONS AND ACRONYMS

PART 1 - GENERAL

1.1 LIST OF ABBREVIATIONS.

A. Abbreviations for standards and organizations used in the Contract Documents are defined as follows:

AA	Aluminum Association
AABC	Associated Air Balance Council
AAMA	Architectural Aluminum Manufacturers Association
AASHTO	American Association of State Highway and Transportation Officials
ABMA	American Bearing Manufacturers Association
ACI	American Concrete Institute
ACPA	American Concrete Pipe Association
AEIC	Association of Edison Illuminating Companies
AFBMA	Antifriction Bearing Manufacturers Association now recognized as the ABMA
AFPA	American Forest & Paper Association
AGA	American Gas Association
AGMA	American Gear Manufacturers Association
AHA	American Hardboard Association
AHRI	Air-Conditioning, Heating and Refrigeration Institute
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AITC	American Institute of Timber Construction
AMCA	Air Movement and Control Association International

ANSI	American National Standards Institute
APA	Engineered Wood Association (formerly American Plywood Association)
API	American Petroleum Institute
AREMA	American Railway Engineers and Maintenance-of-Way Association
ASAHC	American Society of Architectural Hardware Consultants
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigerating, and Air-Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASSE	American Society of Sanitary Engineers
ASTM	ASTM International
AWG	American Wire Gauge
AWI	Architectural Woodwork Institute
AWPA	American Wood-Preservers' Association
AWS	American Welding Society
AWWA	American Water Works Association
BHMA	Builders Hardware Manufacturers Association
BIA	Brick Institute of America (formerly SCPI)
CDA	Copper Development Association
CISPI	Cast Iron Soil Pipe Institute
CMAA	Crane Manufacturers Association of America
CRA	California Redwood Association
CRSI	Concrete Reinforcing Steel Institute
CS	Commercial Standard (U.S. Department of Commerce)
DHI	Door and Hardware Institute

DIPRA	Ductile Iron Pipe Research Association
EEI	Edison Electric Institute
EJCDC	Engineers' Joint Contract Documents Committee
EPA	Environmental Protection Agency
FCC	Federal Communications Commission
FCI	Fluid Controls Institute
Fed Spec	Federal Specification
FGMA	Flat Glass Marketing Association
FHWA	Federal Highway Administration
FIA	Factory Insurance Association
FM	Factory Mutual
FSA	Fluid Sealing Association
HEI	Heat Exchange Institute
HMI	Hoist Manufacturers Institute
HPMA	Hardwood Plywood Manufacturers Association
HTI	Hand Tools Institute
I-B-R	Institute of Boiler and Radiator Manufacturers
IEEE	Institute of Electrical and Electronics Engineers
IBC	International Building Code
IES	Illuminating Engineering Society
IFI	Industrial Fasteners Institute
IPCEA	Insulated Power Cable Engineers Association
IRI	Industrial Risk Insurers
ISA	International Society of Automation
LEED	Leadership in Energy and Environmental Design

MHI	Materials Handling Institute
MIL	Military Specification
MMA	Monorail Manufacturers Association
MSS	Manufacturers Standardization Society of Valve and Fitting Industry
NAAMM	National Association of Architectural Metals Manufacturers
NACE	NACE International
NBBPVI	National Board of Boiler and Pressure Vessel Inspectors
NBS	See NIST
NCSPA	National Corrugated Steel Pipe Association
NEBB	National Environmental Balancing Bureau
NEC	National Electrical Code
NECA	National Electrical Contractors Association
NEII	National Elevator Industry, Inc.
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NIST	National Institute of Standards and Technology (formerly NBS)
NLA	National Lime Association
NPC	National Plumbing Code
NPT	National Pipe Thread
NRMCA	National Ready Mixed Concrete Association
NSC	National Safety Council
NSF	NSF International (formerly National Sanitation Foundation)
NTMA	National Terrazzo and Mosaic Association
NWMA	National Woodwork Manufacturers Association

OSHA	Occupational Safety and Health Administration
PCA	Portland Cement Association
PCI	Precast/Prestressed Concrete Institute
PS	Product Standard
RIS	Redwood Inspection Service
SAE	SAE International
SDI	Steel Door Institute
SFPA	Southern Forest Products Association
SI	Systéme International des Unités (International System of Units)
SIGMA	Sealed Insulating Glass Manufacturers Association
SJI	Steel Joist Institute
SMA	Screen Manufacturers Association
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
SPFA	Steel Plate Fabricators Association
SPI	Society of the Plastics Industry
SPTA	Southern Pressure Treaters Association
SSFI	Scaffolding, Shoring & Forming Institute, Inc
SSPC	SSPC: The Society for Protective Coatings
TABB	Testing, Adjusting, and Balancing Bureau
UL	Underwriters' Laboratories
USBR	U.S. Bureau of Reclamation
USGBC	U.S. Green Building Council
WEF	Water Environment Federation

Abbreviations and Acronyms

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

End of Section

SECTION 01110 – SUMMARY OF WORK

PART 1 - GENERAL

1.1 LOCATION OF WORK

A. The work of this Contract is located at Vertical Well Site at the WTP at 1 NW Briarcliff Road, Kansas City, MO 64120.

1.2 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required and construct the Modernization Improvements at the WTP Phase II – Vertical Well 2-5 Replacement Project in its entirety as shown on the Drawings and as specified herein for a fully functioning system.

B. The Work includes, but is not necessarily limited to, the following:

1. Demolition and abandonment of existing Vertical Wells 2 - 5 as indicated and necessary for the construction of the project including the removal of the vertical well structures, vaults, and associated piping and abandonment of the wells in accordance with MDNR.

2. Installation of the new replacement Vertical Wells 2R – 5R as indicated for construction of the project.

1.3 WORK SEQUENCE

A. Perform Work in sequence as indicated in the contract documents to ensure completion of the Work in the Contract Time. Completion dates of the various stages shall be in accordance with the approved construction schedule submitted by the Contractor.

1.4 CONTRACTOR'S USE OF PREMISES

A. Contractor shall limit the use of the premises for his/her Work and for storage to allow for:

1. Work by other agencies.

2. Owner occupancy.

3. Public use.

B. Coordinate use of premises with Owner.

C. Contractor shall assume full responsibility for security of all his/her and his/her subcontractors materials and equipment stored on the site.

D. If directed by the Owner, move any stored items which interfere with operations of Owner or other contractors.

E. Obtain and pay for use of additional storage or work areas if needed to perform the Work.

1.5 OWNER OCCUPANCY

A. Owner will occupy premises during performance of the work for the conduct of his/her normal operations. Coordinate all construction operations with Owner to minimize conflict and to facilitate Owner usage.

1.6 CONSTRUCTION COORDINATION

A. Contractor shall coordinate with the Owner regarding scheduling and sequence of work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

End of Section

SECTION 01140 – WORK RESTRICTIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes: Requirements for sequencing and scheduling the Work affected by existing site and facility; work restrictions; and coordination between construction operations and plant operations.

1.2 SUBMITTALS

A. Baseline Schedule with OCCP tasks.

B. Operational Change Control Plan (OCCP) Form.

C. Progress Schedule with OCCP tasks.

1.3 GENERAL CONSTRAINTS ON SEQUENCE AND SCHEDULING OF WORK

A. Work sequence and constraints:

1. Utilize description of critical events in work sequence in this Section as a guideline for scheduling and undertaking the Work.

2. Work sequence and constraints presented do not include all items affecting completion of the Work, but are intended to describe critical events necessary to minimize disruption of the existing facilities and to ensure compliance with National Pollutant Discharge Elimination System (NPDES) permit requirements.

B. Instrumentation and controls process performance testing:

1. After the Process Operational Period, test PCIS system as specified in Section 01757 - Commissioning.

1.4 SHUTDOWN AND CONSTRUCTION CONSTRAINTS

A. Normal working hours:

1. Construction will take place during normal working hours as defined:

a. 7AM to 3PM Monday through Friday.
b. Refer to 0700 General Conditions Section 6.03 for further restrictions.

B. General shutdown constraints:

1. Execute the Work while the existing facility is in operation.

2. Some activities may be accomplished without a shutdown.

3. Apply to activities of construction regardless of process or work area.

4. Activities that disrupt plant or utilities operations must comply with these shutdown constraints.

5. Organize work to be completed in a minimum number of shutdowns.

6. Provide thorough advanced planning, including having required equipment, materials, and labor on hand at time of shutdown.

7. Notify the City at least 30 days in advance of any tasks that will require dewatering and cleaning to allow the City the appropriate amount of time to conduct the work.

8. Where required to minimize treatment process interruptions while complying with specified sequencing constraints, provide temporary pumping, power, lighting, controls, instrumentation, and safety devices.

9. Final determination of the permitting of shutdowns will be the sole judgment of the Owner.

10. Owner maintains the ability to abort on the day of the scheduled shutdown or to hold at any hold point.

C. Unit process availability work limitations:

1. Shutdowns and tie-ins or other activities that disrupt plant operations shall not occur if the following conditions exist unless approved by the OWNER in writing, or specified in 01140.01 Process and System Shutdown Constraints Schedule:

D. Shutdown activities:

1. Scheduling:

a. Refer to the Process and Systems Shutdown Constraints Schedule for additional scheduling requirements.
b. Seasonal shutdown constraints:
    1) Winter (December – March): No shutdowns allowed.
    2) Spring (April – June): Max 12-hour shutdowns allowed to one wellfield at a time. Allowability of shutdowns will be dependent on KC Water operations.
    3) Summer/Fall (July-November): Full Availability (no restrictions) for shutdowns.

c. 14-hour maximum shutdown length for an individual well.
d. 8-hour maximum shutdown length for connection to the collector well header pipe
e. No shutdowns on consecutive days. Tuesday and Thursday shutdowns are preferred.

f. Shutdowns shall be during weekdays and during the daytime unless unavoidable. Prior approval must be obtained from WSD for nighttime and weekend shutdowns.

g. Disruptions to the existing vertical wells shall be kept to a minimum. Each replacement well shall only disrupt the vertical well it intends to replace, besides where necessary to connect to the existing collector well header pipe. Said disruptions shall not occur until the transfer to the replacement vertical well can occur.

E. Refer to the Process and System Shutdown Constraints Schedule in Section 01140.01 for additional requirements.

1.5 OPERATIONAL CHANGE CONTROL PLAN (OCCP)

A. Refer to Section 01140.02 - Operational Change Control Plan (OCCP) Documents for additional requirements.

B. Submit Baseline Schedule, as specified in Section 01320 – Construction Progress Documentation.

C. No consideration will be given to claims of additional time and cost associated to preparing OCCPs required by the Owner and Engineer to complete this work in a manner that facilitates proper operation of the facility and compliance with effluent discharge criteria.

D. Where required to minimize treatment process interruptions while complying with specified sequencing constraints, provide temporary pumping, power, lighting, controls, instrumentation, and safety devices.

E. OCCPs are required whenever an existing asset or a new asset that could affect treatment or conveyance are modified including but not limited to set points and operational modes.

1.6 REQUIREMENTS FOR OPERATION OF PLANT AND MAINTAINING CONTINUOUS OPERATION OF EXISTING FACILITIES

A. Facilities or conditions required to keep the existing plant operational include, but are not limited to, the following:

1. Electrical power including transformers, distribution wiring, and motor control centers.

2. Pumping and piping for conveyance of raw water, chemicals, and utilities from the Intake Pump Station.

3. Laboratory facilities.

4. Fencing and gates.

5. Lighting.

6. Heating, ventilation, and air conditioning.

7. Instrumentation, meters, controls, and telemetry equipment.

8. Safety equipment and features.

9. Parking for City employees and vehicles required for operation and maintenance of the facilities.

10. Telephone system.

11. Storm drainage.

12. Natural gas service.

13. Potable water service.

B. Contractor shall protect existing grating with steel traffic plate or other Engineer approved means when moving equipment or supplies over grating.

C. Maximum allowable superimposed live load on any existing grating or walkway shall be 50 psf. If higher loads are proposed, provide detailed calculations demonstrating adequacy of grating or walkway system for higher loads. The calculations shall be sealed and signed by a registered professional engineer and submitted to the Engineer for review and acceptance.

1.7 OPERATION AND MAINTENANCE ACCESS

A. A. Provide safe, continuous access to process control equipment for plant operations personnel

1.8 COORDINATION OF THE WORK

A. Maintain overall coordination of the Work.

B. Obtain construction schedules from subcontractors and suppliers and assume responsibility for correctness.

C. Incorporate schedules from subcontractors and suppliers into Progress Schedule to plan for and comply with sequencing constraints.

1.9 WORK BY OTHERS

A. Where proper execution of the Work depends upon work by others, inspect and promptly report discrepancies and defects.

1.10 UTILITIES

A. Provide advance notice to request and utilize services of the Missouri One Call System (www.mo1call.com or 1-800-344-7483 (DIG-RITE)) for location and marking of underground utilities operated by utility agencies other than the Owner.

B. Maintain electrical, telephone, water, gas, sanitary facilities, and other utilities within existing facilities in service. Provide temporary utilities when necessary.

C. New yard utilities were designed using existing facility drawings.

1. Field verification of utilities locations was not performed during design.

2. Services crossed or located nearby new yard utilities may require relocation and possible shutdowns.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PROCESS AND SYSTEM SHUTDOWN CONSTRAINTS SCHEDULE

A. Refer to the Process and System Shutdown Constraints Schedule in Section 01140.01 for constraints on process and system shutdowns.

B. Requests for variance from any part of this schedule must be approved in writing by the OWNER.

C. The planned date of shutdown as listed on the Operational Change Control Plan (OCCP) form shall be considered the start date for the shutdown and used for calculating the actual shutdown duration, unless approved in writing by the OWNER. In the event that the OWNER can shut down a system or process prior to the planned date of shutdown and the CONTRACTOR agrees to commence work at that earlier date, the date that the CONTRACTOR commences work on the associated process or system shall be considered the start date for the shutdown and for calculating the actual shutdown duration.

D. These constraints are intended to supplement the demolition, modification, tie-in, and construction activities and constraints described in Article 1.12 of this Section.

End of Section

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01140.01 - PROCESS AND SYSTEM SHUTDOWN CONSTRAINTS SCHEDULE

PART 1 GENERAL

1.01 SUMMARY

A. Section includes: Information on the shutdown constraints for each of the major processes.

1.02 DEFINITIONS

A. Maximum Shutdown Duration: The maximum allowable time in calendar days (unless otherwise noted) that a process and its associated piping, valves, channels, gates, etc. may be removed from service to perform the required work on that process.

B. Minimum Time Between Shutdowns: The minimum amount of time in calendar days (unless otherwise noted) between consecutive shutdowns of a process and its associated piping, valves, channels, gates, etc. 3.

C. Maximum Number of Shutdowns: The maximum number of times that a process and its associated piping, valves, channels, gates, etc. may be removed from service to perform the required work on that process. In cases where only one (1) shutdown is allowed, a value has been listed in the "Minimum Time Between Shutdowns" column to provide guidance if additional shutdowns are determined to be required.

D. Seasonal Shutdown Constraint: The approximate time period during which a process shall remain in service and no work shall be performed on that process.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.01 PROCESS AND SYSTEM SHUTDOWN CONSTRAINTS SCHEDULE

A. The Process and System Shutdown Constraints Schedule is presented on the following pages.

B. Requests for variance from any part of this schedule must be approved in writing by the OWNER.

C. The planned date of shutdown as listed on the Operational Change Control Plan (OCCP) form shall be considered the start date for the shutdown and used for calculating the actual shutdown duration, unless approved in writing by the OWNER. In the event that the OWNER can shut down a system or process prior to the planned date of shutdown and the CONTRACTOR agrees to commence work at that earlier date, the date that the CONTRACTOR commences work on the associated process or system shall be considered the start date for the shutdown and for calculating the actual shutdown duration.

D. These constraints are intended to supplement the demolition, modification, tie-in, and construction activities and constraints described in Section 01140 - Work Restrictions.

PROCESS AND SYSTEM SHUTDOWN CONSTRAINTS SCHEDULE				
Replacement Well Work Sequence	**Maximum Shutdown Duration**	**Minimum Time Between Shutdowns**	**Maximum Number of Shutdowns**	**Notes**
Well 2	14 hours	1 Day	1	1,2,3
Well 3	14 hours	1 Day	1	1,2,3
Well 4	14 hours	1 Day	1	1,2,3
Well 5	14 hours	1 Day	1	1,2,3
Wellfield Work Sequence				
North Wellfield (Wells 5, 8, 9, 12, 13, 14	8 hours	1 Day	1	1,2,3
South Wellfield Area 1 (Wells 1, 2, 3, 4)	8 hours	1 Day	4	1,2,3
South Wellfield Area 2 (Wells 10, 11)	8 hours	1 Day	5	1,2,3

General Notes:

(1) NC = No Constraints

(2) NA = Not Applicable

Notes:

(1) No shutdowns on consecutive days. Tuesday and Thursday shutdowns are preferred.

(2) Shutdowns shall be during weekdays and during the daytime unless unavoidable. Prior approval must be obtained from WSD for nighttime and weekend shutdowns.

(3) Seasonal Shutdown Constraints

a) Winter (December – March) - No shutdowns allowed.

b) Spring (April – June) - Max 12-hour shutdowns to one wellfield at a time. Allowability of shutdowns will be dependent on KC Water Operations.

c) Summer/Fall (July – November) - Full availability (no restrictions) for shutdowns.

END OF SECTION

SECTION 02050 - DEMOLITION

PART 1 - GENERAL

1.1 SCOPE

A. This section covers the demolition of existing structures, piping, and sitework and the salvage of existing materials and equipment as indicated on the Drawings.

1.2 GENERAL

A. Contractor shall be responsible for all work under this section. Contractor shall provide 30 days written notice prior to beginning demolition activities.

B. All structures and facilities of the existing wells and intake facilities which are not to be removed must remain in continuous operation during the work.

C. Demolition work shall create minimum interference with Owner's operations and minimum inconvenience to Owner. Contractor shall provide protection and safety of all roadways, sidewalks, and all accessible areas during demolition activities.

D. Blasting will not be permitted.

1.3 SUBMITTALS

A. Demolition Plan.

1. Contractor shall submit a detailed demolition plan indicating the major demolition activities, planned dates, Owner coordination requirements, permit requirements (if any), and any special planning considerations that require coordination with third-parties.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

3.1 SALVAGE

A. Contractor shall salvage the following items from the Existing Vertical Wells 2-5:

1. All existing vertical well motors and associated components, wiring, etc.

3.2 DEMOLITION

A. Removal of equipment or facilities shall include removal of all accessories, piping, wiring, supports, associated electrical starters and devices, baseplates and frames, and all other appurtenances, unless otherwise directed. Existing materials and equipment removed, and not indicated to be reused as a part of the Work, shall become Contractor's property unless otherwise specified, and shall be removed from the Site and properly disposed of or recycled in accordance with state laws.

B. Contractor shall conduct demolition activities in a manner that prevents damage to existing facilities which are indicated to remain and shall provide all necessary protection for existing facilities. Any remaining facilities damaged during demolition shall be repaired by Contractor to a condition equal to or better than the original condition.

C. When demolition is complete, all debris shall be removed from the Site and the Site graded to the lines and grades indicated on the Drawings.

D. Demolished wells shall be plugged and capped in accordance with MDNR requirements and 10 CSR 23.3.110.

E. Structure Demolition

1. The following structures shall be demolished, and the debris shall be removed from the jobsite. Limitations of removal are indicated on the drawings.

    a. Existing Vertical Wells 2 through 5.
    b. Concrete Valve Vaults for existing Vertical Wells 2 through 5.

F. Piping and Equipment Demolition

1. The following piping and equipment shall be removed and shall become the property of Contractor. All such items shall be promptly removed from the jobsite.

    a. All piping and equipment associated with existing Vertical Wells 2 through 5.
    b. Piping, valves, hydrants within the existing Valve Vaults for Vertical Wells 2 through 5 and to any portion of the header being demolished.

G. Sitework Demolition

1. Sitework demolition shall include the following:

    a. Removal of asphaltic concrete pavement and concrete curb within the limits indicated on the Drawings.
    b. Removal of trees and shrubs indicated on the Drawings to be removed and as required to complete the work.
    c. Removal of existing yard piping within the limits indicated on the Drawings.
    d. Removal of existing electrical ducts and cables as indicated on the Drawings.

H. Tree and Plant Protection

1. All trees and other vegetation which must be removed to perform the Work shall be removed and disposed of by Contractor; however, no trees or cultured plants shall be unnecessarily removed unless their removal is indicated on the Drawings. All trees and plants not removed shall be protected against injury from construction operations.

2. All trees within the limits of construction with a diameter of 4-inches and larger shall be maintained and protected by temporary fencing during construction. If trees larger than 4-inches must be removed to perform the Work, the Contractor shall notify Engineer prior to the removal.

3. Contractor shall take extra measures to protect trees designated to be preserved, such as erecting barricades, trimming to prevent damage from construction equipment, and installing pipe and other Work by means of hand excavation or tunneling methods. Such trees shall not be endangered by stockpiling excavated material or storing equipment against their trunks.

4. All trimming, repair, and replacement of trees and plants shall be performed by qualified nurserymen or horticulturists.

5. Tree removal shall be limited to occur only between November and March 31. Removal of trees and shrubs outside of this requires a habitat assessment followed by a presence/absence survey to be submitted to the US Fish and Wildlife Service at the expense of the Contractor.

End of Section

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TEMPORARY EARTH RETENTION
DESIGN CERTIFICATE – Figure 1 - 02200

I, the undersigned professional engineer licensed in the state where the earthwork is located, hereby certify that the temporary excavation for the _____(structure name) excavation at _____ (structure location) has been designed by me, is appropriate for the _____ (structure name), as represented to me, and is in compliance with the Contract Documents (including protecting adjacent structures, utilities, and other facilities from damage, and not providing a temporary earth retention design to Contractor that includes soldier piles with steel plate lagging, slide rail systems, and trench shields).

Name: _____ State of License: _____

Signature: _____ P.E. Number _____

Date: _____

_____
(Seal)

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SECTION 02202 - TRENCHING AND BACKFILLING

PART 1 - GENERAL

1.1 SCOPE

A. This section covers clearing, grubbing, and preparation of the site; removal and disposal of all debris; excavation and trenching; the handling, storage, transportation, and disposal of all excavated material; all necessary sheeting, shoring, and protection work; preparation of subgrades; pumping and dewatering as necessary; protection of adjacent property; backfilling; pipe embedment; surfacing and grading; and other appurtenant work.

1.2 GENERAL

A. With reference to the terms and conditions of the construction standards for excavations set forth in OSHA "Safety and Health Regulations for Construction", Chapter XVII of Title 29, CFR, Part 1926, Contractor shall employ a competent person and, when necessary based on the regulations, a licensed or registered professional engineer, to act upon all pertinent matters of the work of this section.

1.3 SUBMITTALS

A. Drawings and Data – General

1. Drawings, specifications, and data covering the proposed materials shall be submitted in accordance with the Submittals Procedures section.

B. Certifications.

1. At least 30 days before starting construction on the sheeting and shoring, and in accordance with the OSHA requirements identified above, the Contractor shall ensure that the sheeting and shoring design engineer shall complete and submit to Engineer theTemorary Protective System Design Certificate, Figure 1 – 02202 and the Contractor shall use the sheeting and shoring design. If required by the OSHA requirements identified above or to protect existing facilities, the Contractor shall submit a separate certificate for each unique design. If required for protection of existing facilities or as required by the OSHA regulations identified above, the certificate(s) shall be signed and sealed by the registered professional engineer that designed the protection system.

C. Filter Fabric Data

a. Not used.

D. Embedment and Backfill Materials

1. Complete test results covering tests performed by an independent commercial testing laboratory retained by the Contractor for all materials described in the Materials Testing section shall be submitted.

1.4 INSURANCE

A. Professional liability insurance shall be provided as specified in the Supplementary Conditions section, if applicable.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General

1. All work is within the critical zone of the North Kansas City Levee District. Crushed rock or other pervious materials will not be permitted within the critical zone for fill or backfill.

B. Polyethylene Film

1. Not used.

C. Tunnel Materials

1. Not used

D. Backfill Materials

1. Job Excavated Material

a. Job excavated material may be used for either uncompacted or compacted trench backfill when the job excavated material meets the requirement of the USACE for impervious materials. Impervious materials shall meet the requirements of Group Symbol ML, CL, and CH per ASTM D2487. The material shall be finely divided, and free from debris, organic material, cinders, corrosive material, and stones larger than 3 inches in greatest dimension. Masses of moist, stiff clay shall not be used.

b. To the maximum extent available, excess suitable material obtained from structure and trench excavation shall be used for the construction of site fills and embankments. Additional material shall be provided from Contractor's offsite source. No borrow pits shall be opened on Site.

E. Controlled Low Strength Material (CLSM) Fill

1. CLSM shall consist of a mixture of Portland cement, fly ash, sand, and water and shall be placed at locations indicated on the Drawings or as directed by Engineer. The class of CLSM shall be as specified below.

2. CLSM shall be in accordance with US Army Corp of Engineers (USCOE) guidance document (Excavation and Backfill, Paragraph 4.9), which can be found Guidance documents at the following web address and as noted below:

https://www.nwk.usace.army.mil/Missions/Engineering-Division/Geotechnical-Branch/Geotechnical-Design-and-Dam-Safety/

Materials for CLSM shall be as indicated in the following table.

Material	Fill Mix (batch weights per cubic yard)	Remarks
Portland Cement, Type I or II (lbs)	At least 100	ASTM C 150 meeting low alkali requirements. Alternately, Ground Granulated Blast Furnace Slag (GGBFS) cement conforming to ASTM C 989 Grade 100 or 120 is acceptable.
Fly Ash (lbs)	At least 275	ASTM C 618, Class N, C, or F. (Class C shall not be used with Missouri River Sand, or aggregate, which exhibits alkali-aggregate reactivity potential).
Sand, SSD (lbs)	2795	ASTM C 33, concrete fine aggregate. Projects requiring 200 cubic yards or more of flowable fill shall be tested for alkali-aggregate reactivity in accordance with ASTM C 1260. Test results shall indicate measured expansion of less than 0.10% at 16 days after

Material	Fill Mix (batch weights per cubic yard)	Remarks
		casting.
Total Water (lbs)	No more than 370	Potable source
Air Entraining Agent, oz	At least 2	ASTM C 260
Water Reducing Admixture	As required to produce a cohesive flowable mixture	ASTM C 494, Type A or F. See note 4 below.

3. CLSM shall have a compressive strength of 100 psi at 28 days age.

4. CLSM mixture shall not be thin and watery, but shall have a consistency similar to that of pancake batter. It shall be tested by filling an open-ended 3-inch diameter, 6-inch high cylinder to the top with the mixture and immediately pulling the cylinder straight up. The correct consistency will produce an approximate 8-inch diameter circular-type spread with no segregation.

5. Contractor shall test the CLSM and submit the mix design and test results to Engineer for review and acceptance.

6. The batch proportions accepted by Engineer shall apply only for materials from the same source and having the same characteristics as the materials used in the mix design. Materials from any other source shall be used only with the acceptance of Engineer. If a change in sources of materials is proposed, a new mix design shall be developed by Contractor before the new material is used. When unsatisfactory results or other conditions make it necessary, Contractor shall develop a new mix design to obtain the desired results.

7. During the progress of the work, no change shall be made in the batch proportions of the ingredients without the acceptance of Engineer.

F. Pipe Embedment Material

1. Pipe embedment material shall be CLSM and shall be placed as indicated on the Drawings.

G. Trench Backfill

1. Pipe trench backfill (as indicated on the Drawings) shall be impervious materials such as silts, clays (ML, CL,and CH).

2.2 MATERIALS TESTING

A. Preliminary Review of Materials

1. As stipulated in the Quality Control section, all tests required for preliminary review of materials shall be made by an acceptable independent testing laboratory at the expense of Contractor.

B. Field Testing Expense

1. All field tests shall be made by an independent testing laboratory at the expense of Contractor. Contractor shall provide access to the materials and work area and shall assist the laboratory as needed in obtaining representative samples.

C. Required Field Tests

1. For planning purposes, the following guidelines shall be used for frequency of field tests. Additional tests shall be performed as necessary for job conditions and number of failed tests. Test results shall be submitted as specified in the Submittals Procedures section.

    a. Two moisture density (Proctor) tests in accordance with ASTM D698 (or, when required, ASTM D1557), or two relative density tests in accordance with ASTM D4253 and D4254 for each type of general fill, designated fill, backfill, or other material proposed.
    b. In-place field density and moisture tests (ASTM D6938) at intervals of 100 feet maximum along the trench.
    c. One in-place field density and moisture test (ASTM D6938) for every 100 cubic yards of backfill.
    d. One in-place density and moisture test (ASTM D6938) whenever there is a suspicion of a change in the quality of moisture control or effectiveness of compaction.
    e. Additional gradation, Proctor, and relative density tests whenever the source or quality of material changes.
    f. Testing of CLSM shall be as follows:
    Compressive Strength. For every 100 cubic yards of CLSM placed, fill four 6 by 12 inch plastic cylinder molds to overflowing and then tap sides lightly. Cure cylinders in the molds covered until time of testing, at least 14 days. Strip the cylinders carefully using a knife to cut away the plastic mold. Cap the cylinders with high strength gypsum plaster or other capping process that will not break these low strength materials. Test cylinders in accordance with ASTM C39. Two cylinders shall be tested at 7 days and the other two cylinders shall be tested at 56 days.
    Flow of Fill. Once each day that CLSM is placed, test the fill material in accordance with ASTM C939 for the efflux time. Wet screening may be required to remove coarse particles.
    Unit Weight and Yield. Once each day that CLSM is placed, determine unit weight and yield in accordance with ASTM C138.
    Air Content. Once each day that CLSM is placed, determine air content in accordance with ASTM C231.

Penetration Resistance. Once each day that CLSM is placed, determine early bearing strength in accordance with ASTM C403 penetration procedure.

PART 3 - EXECUTION

3.1 CLEARING

A. All clearing shall be performed as necessary for access, stringing of pipeline materials, and construction of the pipeline and appurtenant structures.

3.2 EXCAVATION

A. Excavations shall provide adequate working space and clearances for the work to be performed therein and for installation and removal of concrete forms. In no case shall excavation faces be undercut for extended footings.

B. Subgrade surfaces shall be clean and free of loose material of any kind when concrete is placed thereon.

C. All vertical concrete faces, including foundations, shall be cast against formwork. Casting the concrete against the excavation face will not be allowed..

D. Backfilling and construction of fills and embankments during freezing weather shall not be done except with the permission of the Engineer. No backfill, fill, or embankment materials shall be installed on frozen surfaces, nor shall frozen materials, snow, or ice be placed in any backfill, fill, or embankment.

E. Classification of Excavated Materials

1. No classification of excavated materials will be made for payment purposes. Excavation and trenching work shall include the removal and subsequent handling of all materials excavated or otherwise removed in performance of the work, regardless of the type, character, composition, or condition thereof.

F. Preservation of Trees

1. No trees shall be removed outside excavated or filled areas, unless their removal is authorized by Owner. Trees left standing shall be adequately protected from permanent damage by construction operations.

G. Blasting

1. Blasting or other use of explosives for excavation will not be permitted.

H. Dewatering

1. Dewatering shall meet the requirements of the USACE.

2. Dewatering equipment shall be provided to remove and dispose of all surface water and groundwater entering excavations, trenches, or other parts of the work. Each excavation shall be kept dry during subgrade preparation and continually thereafter until the structure or tunnel to be built, or the pipe to be installed therein, is completed to the extent that no damage from hydrostatic pressure, flotation, or other cause will result.

3. All excavations for concrete structures or trenches which extend down to or below groundwater shall be dewatered by lowering and keeping the groundwater level to the minimum depth of 24 inches , beneath such excavations. The specified dewatering depth shall be maintained below the prevailing bottom of excavation at all times.

4. Surface water shall be diverted or otherwise prevented from entering excavations or trenches to the greatest extent possible without causing damage to adjacent property.

5. Contractor shall be responsible for the condition of any pipe or conduit which he may use for drainage purposes, and all such pipe or conduit shall be left clean and free of sediment.

6. Contractor shall obtain from the appropriate agencies and authorities, the dewatering and stormwater discharge permits required to remove and dispose of groundwater, surface water, and any other water used in Contractor's operations. The permits shall be obtained prior to start of construction.

I. Temporary Earth Retention

1. Except where banks are cut back on a stable slope, excavations for structures and trenches shall be supported with steel sheet piling and shoring as necessary to prevent caving or sliding. The requirements and resistrictions of Excavation and Fill for Structures specification also apply to this specfications

2. Sheet piling or other temporary earth retention systems shall be installed as necessary to limit the extent of excavations for deeper structures and to protect adjacent structures and facilities from damage due to excavation and subsequent construction. Contractor shall assume complete responsibility for, and shall install adequate protection systems for prevention of damage to existing facilities.

3. The use of plate lagging with soldier piles and slide rail systems or other preengineered systems are not allowed. Trench shields i.e., trench boxes are worker protection devices and their use will not be allowed.

4. All portions of excavation support systems shall be completely removed by the end of the project. The design of the excavation support system shall be such as to permit complete removal while maintaining safety and stability at all times. Any voids created from the removal of the excavation support system shall be completely filled with CLSM. Any

cross braces installed above the pipe shall be removed after pipe embedment has been completed.

5. Temporary earth retention systems shall be designed by a professional engineer registered in Missouri.

J. Stabilization

1. Subgrades for concrete structures and trench bottoms shall be firm, dense, and thoroughly compacted and consolidated; shall be free from mud and muck; and shall be sufficiently stable to remain firm and intact under the feet of the workers.

2. Subgrades for concrete structures and trench bottoms which are otherwise solid, but which become mucky on top due to construction operations, shall be reinforced with CLSM. The stabilizing material shall be placed in a manner that no voids remain in the fill. The finished elevation of stabilized sub-grades shall not be above sub-grade elevations indicated on the Drawings.

3.3 TRENCH EXCAVATION

A. No more trench shall be opened in advance of pipe laying than is necessary to expedite the work. 100 feet shall be the maximum length of open trench on any line under construction. Contractor shall ensure that any open trench can be timely backfilled upon rising river conditions. See the North Kansas City Levee District paragraph of the Project Requirements section.

B. Except where tunneling is indicated on the Drawings, is specified, or is permitted by Engineer, all trench excavation shall be open cut from the surface.

C. Prior to excavation, Contractor shall contact local underground alert hotlines, “Dig Safe” and/or individual utility owners for marking underground utilities. Once utilities are marked, Contractor shall hand dig or pothole to expose the existing utilities within the vicinity of proposed work. Contractor shall determine clearance before start of excavation for installation of new piping is installed. Contractor shall submit and coordinate location and elevations of utilities identified with Engineer. A survey shall be made of the utility size, material, location, and elevation prior to trench excavation and information shall be recorded on the record Drawings maintained by the Contractor.

D. Potholing may not be started when the river level is at or forecasted to rise above the action state of 29 feet as reflected in the Missouri river at the Kansas City River Gauge.

E. Grade, and Minimum Cover

1. The alignment and grade or elevation of each pipeline shall be fixed and determined from offset stakes. Vertical and horizontal alignment of pipes, and the maximum joint deflection used in connection therewith, shall be in conformity with requirements of the section covering installation of pipe.

2. Where pipe grades or elevations are not definitely fixed by the Drawings, pipe shall slope uniformly between fixed points to avoid low and high points.

F. Maximum Trench Widths

1. Not used.

G. Minimum Trench Widths

1. Except when maximum trench width is required for certain conduits, trenches shall be excavated to the minimum trench widths indicated in the following table. Trenches shall be excavated to a width which will provide adequate working space and sidewall clearances for proper pipe installation, jointing, and embedment.

Nominal Pipe Size	Minimum Trench Width	Clearance
All pipe	Pipe OD plus 24 in	12 in

Clearance = Minimum sidewall clearance
OD = Outside diameter (or span) of conduit
ID = Inside diameter (or span) of conduit.

2. Specified minimum sidewall clearances are not minimum average clearances but are minimum clear distances which will be required to the trench excavation or the trench protective system.

3. Cutting trench banks on slopes to reduce earth load to prevent sliding and caving shall be used only in areas where the increased trench width will not interfere with surface features, adjacent utilities, or encroach on right-of-way limits.

H. Mechanical Excavation

1. The use of mechanical equipment will not be permitted in locations where its operation would cause damage to trees, buildings, culverts, or other existing property, utilities, or structures above or below ground. In all such locations, hand excavating methods shall be used.

2. Mechanical equipment used for trench excavation shall be of a type, design, and construction, and shall be so operated, that the rough trench excavation bottom elevation can be controlled, and that trench alignment is such that pipe, when accurately laid to specified alignment, will be centered in the trench with adequate sidewall clearance. Undercutting the trench sidewall to obtain sidewall clearance will not be permitted.

I. Cutting Concrete Surface Construction

1. Cuts in concrete pavement and concrete base pavements shall be no larger than necessary to provide adequate working space for proper installation of pipe and appurtenances. Cutting shall be started with a concrete saw in a manner which will provide a clean groove at least 1-1/2 inches deep along each side of the trench and along the perimeter of cuts for structures.

2. Concrete pavement and concrete base pavement over trenches excavated for pipelines shall be removed so that a shoulder not less than 6 inches in width at any point is left between the cut edge of the pavement and the top edge of the trench. Trench width at the bottom shall not be greater than at the top and no undercutting will be permitted. Pavement cuts shall be made to and between straight or accurately marked curved lines which, unless otherwise required, shall be parallel to the center line of the trench.

3. Pavement removal for connections to existing lines or structures shall not exceed the extent necessary for the installation.

4. Where the trench parallels the length of concrete walks, and the trench location is all or partially under the walk, the entire walk shall be removed and replaced. Where the trench crosses drives, walks, curbs, or other surface construction, the surface construction shall be removed and subsequently replaced between existing joints or between saw cuts as specified for pavement.

J. Excavation Below Pipe

1. Except where otherwise required, pipe trenches shall be excavated below the underside of the pipe (6 inches) to provide for the installation of CLSM embedment.

2. Bell holes shall provide adequate clearance for tools and methods used for installing pipe. No part of any bell or coupling shall be in contact with the trench bottom, trench walls, or embedment when the pipe is jointed.

K. Artificial Foundations in Trenches

1. Whenever unsuitable or unstable soil conditions are encountered, Contractor shall notify Engineer immediately. When authorized by the Engineer , trenches shall be excavated below grade and the trench bottom shall be brought to grade with CLSM. In such cases, adjustments will be made in the Contract Price in accordance with the provisions of the General Conditions.

L. Over-Excavation

1. Over-excavation carried below the grade, unless authorized by the Engineer, shall be backfilled to the required grade with material acceptable to the Engineer and compacted to the satisfaction of the Engineer, at no additional cost to the Owner.

3.4 PIPE EMBEDMENT

A. Embedment materials shall be CLSM as specified herein and as indicated on the Drawings.

B. Placement

1. Pipe shall be supported on the bottom of the trench with temporary supports. CLSM material shall be placed under the pipe to the height as specified around the pipe and shall be allowed to set up before any backfill is added.

2. After each pipe has been aligned and placed in its final position, and shoved home, sufficient pipe embedment material shall be deposited under and around each side of the pipe and back of the bell or end thereof by suitable methods to hold the pipe in proper position and alignment.

3. Embedment materials shall be deposited uniformly and simultaneously on each side of the pipe to prevent lateral displacement.

4. Embedment shall be placed in lift thicknesses that prevents floatation of the pipe, with maximum lift thickness of 12 inches unless otherwise acceptable to Engineer.

3.5 TRENCH BACKFILL

A. All trench backfill above pipe embedment shall conform to the following requirements.

B. Backfill

1. Backfill must be placed in loose lifts with thickness not to exceed 8 inches and compacted to a minimum of 95 percent of maximum Standard Proctor dry density determined at ptimum moisture content according to ASTM D-698. Moisture control limits are to be within -1% to +3% of optimum.

2. Compacted backfill will be required for the full depth of the trench above the embedment except as noted below:

   a. Excavated on-site materials may be used provided they meet the requirements of this specification.
   b. Contractor shall import any additional material required for trench backfill at their expense.
   c. Excavated suitable trench backfill may be stockpiled on site and shall be segregated from unsuitable trench backfill.
   d. All unsuitable backfill material excavated for trenches and other structuers shall be removed from the site.

3. The top portion of backfill for all areas disturbed by construction shall be finished with at least 12 inches of native topsoil suitable for seeding. If on site native topsoil is not suitable for seeding, additional suitable topsoil shall be provided.

4. Trench backfill material shall be impervious material and shall be as specified herein.

5. Job Excavated Material

   a. Job excavated materials may be used for trench backfill when the job excavated material meets the requirements for impervious materials as specified above, is finely divided and free from debris, organic material, cinders, any corrosive material, and stones larger than 3 inches in greatest dimensions. Job excavated materials shall be placed in uniform layers not exceeding 8 inches in uncompacted thickness. Each layer of material shall have the best possible moisture content for

satisfactory compaction. The material in each layer shall be wetted or dried as needed and thoroughly mixed to ensure uniform moisture content and adequate compaction. Increased layer thickness may be permitted for noncohesive material if Contractor demonstrates to the satisfaction of Engineer that the specified compacted density will be obtained. The method of compaction and the equipment used shall be appropriate for the material to be compacted and shall not transmit damaging shocks to the pipe. Job excavated material shall be compacted to as specified herein for trench backfill.

6. Inundated Sand

   a. Not used.

7. Graded Gravel

   a. Not used.

C. Structure Backfill

1. Backfill around manholes and small concrete vaults shall meet the requirements specified for structure backfill specified in the Excavation and Fill for Structures section.

D. Controlled Low Strength Material (CLSM)

1. CLSM shall not be placed on frozen ground. Batching, mixing, and placing of CLSM may be started when weather conditions are favorable and when the temperature is at least 34°F and rising. At time of placement, CLSM shall have a temperature of at least 40°F . Mixing and placing shall stop when the temperature is 38°F and falling. Each filling stage shall be as continuous an operation as is practicable.

2. CLSM shall be discharged from the mixer by an acceptable procedure into the area to be filled. CLSM shall be placed to limits indicated on the Drawings. Mixing CLSM with in-situ soil shall be avoided.

3. When CLSM is placed as backfill against structures, the fill shall be placed in lifts of 2 to 3 feet and the next lift shall not be placed until the previous lift has taken initial set and at least 16 hours have elapsed from the end of placement. Lift thickness shall be reduced as necessary to prevent floatation of the structure.

4. When CLSM is placed around pipelines, they shall be anchored to prevent flotation during the placement of CLSM. Unless otherwise required, CLSM shall be placed to the centerline of the pipe.

3.6 TUNNEL EXCAVATION

A. Not used.

3.7 DRAINAGE MAINTENANCE

A. Trenches across roadways, driveways, walks, or other trafficways adjacent to drainage ditches or watercourses shall not be backfilled prior to completion of backfilling the trench on the upstream side of the trafficway, to prevent impounding water after the pipe has been laid. Bridges and other temporary structures required to maintain traffic across such unfilled trenches shall be constructed and maintained by Contractor. Backfilling shall be done so that water will not accumulate in unfilled or partially filled trenches. All material deposited in roadway ditches or other watercourses crossed by the line of trench shall be removed immediately after backfilling is completed, and the original section, grades, and contours of ditches or watercourses shall be restored. Surface drainage shall not be obstructed longer than necessary.

B. Additional requirements for temporary drainage and erosion control are covered in the Erosion Control section.

3.8 PROTECTION OF TRENCH BACKFILL IN DRAINAGE COURSES

A. Where trenches are constructed in ditches or other watercourses, backfill shall be protected from surface erosion. Where the grade of the ditch exceeds 1 percent, or as otherwise required, ditch checks shall be installed. Unless otherwise indicated on the Drawings, ditch checks shall be concrete. Ditch checks shall extend at least 2 feet below the original ditch or watercourse bottom for the full bottom width and at least 18 inches into the side slopes, and shall be at least 12 inches thick.

3.9 FINAL GRADING AND PLACEMENT OF TOPSOIL

A. After other outside work has been finished, and backfilling and embankments completed and settled, all areas which are to be graded shall be brought to grade at the indicated elevations, slopes, and contours. All cuts, fills, embankments, and other areas which have been disturbed or damaged by construction operations shall be surfaced with topsoil to a depth of at least 4 inches . Topsoil shall be of a quality at least equal to the existing topsoil in adjacent areas, free from trash, stones, and debris, and well suited to support plant growth. Topsoil required to provide the minimum thickness shall be imported and placed at no additional cost to the Owner.

B. Use of graders or other power equipment will be permitted for final grading and dressing of slopes, provided the result is uniform and equivalent to manual methods. All surfaces shall be graded to secure effective drainage. Unless otherwise indicated, a slope of at least 1 percent shall be provided.

C. Final grades and surfaces shall be smooth, even, and free from clods and stones, weeds, brush, and other debris.

3.10 DISPOSAL OF EXCESS EXCAVATED MATERIALS

A. Disposal of excess material from other trench excavation sites shall be as follows. Except as otherwise permitted, all excess excavated materials shall be disposed of away from the site.

B. Broken concrete and other debris resulting from pavement or sidewalk removal, excavated rock in excess of the amount permitted to be installed in trench backfill, debris encountered in excavation work, and other similar waste materials shall be disposed of away from the site.

C. The disposal of waste and excess excavated materials, including hauling, handling, grading, and surfacing, shall be subsidiary obligation of Contractor and no separate payment will be made therefor.

3.11 RESEEDING

A. All disturbed areas shall be reseeded as indicated in the Seeding section.

3.12 SETTLEMENT

A. Contractor shall be responsible for all settlement of trench backfill which may occur within the correction period stipulated in the General Conditions.

B. Contractor shall make, or cause to be made, all repairs or replacements made necessary by settlement within 30 days after notice from Engineer or Owner.

End of Section

SECTION 02512 - ASPHALT PAVING

PART 1 - GENERAL

1.1 SCOPE

A. This section covers the furnishing of labor, materials and equipment for the construction of asphaltic concrete base or binding course, bituminous tack coat, and asphaltic concrete surface or wearing course for the roadway, driveways and parking area as indicated on the Drawings.

B. Subgrade preparation shall be as indicated in the Excavation and Fill for Structures section, unless otherwise specified in the governing standards or herein.

C. Asphaltic concrete paving shall be constructed to the lines, grades, and cross sections indicated on the drawings. Type of construction shall be as indicated on the Drawings and as specified herein.

1.2 GENERAL

A. Governing Standards

1. Except as otherwise specified or indicated, materials, equipment, details, and construction methods shall comply with the applicable APWA Standard Specifications and Design Criteria, Division II, and Kansas City, Missouri Supplements, Standards, and Utility Cut regulations.

B. Coordination

1. Contractor shall coordinate the construction of asphaltic concrete paving with the excavation, the construction of concrete curb and gutters and other construction.

1.3 SUBMITTALS

A. Design Mix Reports

1. All submittals of design mix reports including design mix test results and other data, shall be in accordance with the Submittals Procedures section.

B. Submittal Schedule.

1. Design mix data as specified below.

PART 2 - PRODUCTS

2.1 MATERIALS

A. The sources of materials shall be acceptable to Engineer and Owner. Except as modified herein, materials shall conform to the requirements of the governing standards and standard details. Delivery tickets for all materials delivered to the site shall be submitted to Engineer at the end of each day during the progress of the work.

B. Asphaltic concrete materials shall conform to Kansas City Public Works Asphaltic Concrete Type 5-01 as specified in Section 2200 - Paving of KC KCMO standard Construction and Material Specifications.

2.2 DESIGN MIXES

A. A design mix for the asphalt base course and for the surface course, based upon the aggregates to be furnished, shall be determined by an independent testing laboratory at the expense of Contractor and shall be submitted to Engineer for review.

B. The design mixes shall be based on the KCMO standard Construction and Material Specifications Section 2200 Paving Type – 5-01 per Standard Drawing Number SR-1 Street Cut Restoration and upon acceptance by Engineer shall be the basis for the mixes to be used in asphaltic concrete pavement construction. The proposed design mix data submitted for review shall include at least the following:

1. Marshall stability, all mixtures
2. Density
3. Number of compaction blows
4. Flow, all mixtures

PART 3 - EXECUTION

3.1 GENERAL

A. Paving shall be performed in accordance per Standard Drawing Number SR-1 Street Cut Restoration as shown in the drawings.

3.2 EQUIPMENT

A. Equipment and facilities for storage, measuring, mixing, heating, transporting, spreading, compacting, and other operations shall be in accordance with the applicable requirements of the

governing standards. Improved or modernized equipment which will produce results equal in quality to those which would result from the specified equipment will be considered for use. All equipment and facilities shall be acceptable to Engineer.

3.3 SUBGRADE PREPARATION

A. As a minimum, the top 6 inches of the subgrade shall be compacted to 95 percent of standard proctor density at optimum moisture content as determined by governing standards. In addition, the stability of subgrades shall be such that when materials for construction are deposited on the subgrade no rutting or displacement of the subgrade by material hauling vehicles will occur. No materials shall be placed on subgrades which are muddy, frozen, or have frost, snow, or water thereon. Subgrades shall be thoroughly compacted and properly shaped before any surfacing materials are placed. All subgrade and surfacing shall be sloped toward drains or outer edges.

3.4 PAVEMENTS

A. Unless otherwise specified, the new pavements to be constructed shall consist of an asphaltic concrete base course and an asphaltic concrete surface course, each of the thickness indicated on the Drawings. Asphaltic concrete base course shall be placed in compacted lifts no greater than 4 inches. Asphaltic concrete surface course shall be placed in compacted lifts no greater than 2 inches.

B. Grade control shall be maintained by Contractor by means of automatic screen controls on the paving machine and by use of erected and mobile string lines as applicable. The use of the automatically controlled paver may be waived by Engineer on irregular sections. Finished surfaces shall conform to the lines and grades indicated on the Drawings.

C. Asphaltic concrete pavements shall be constructed on previously prepared subgrades in accordance with the sections, in compliance with the governing standards.

D. Asphalt mixtures may be spread and finished by hand methods only where machine methods are impractical as determined by Engineer. Hand placed mixtures shall not be cast or otherwise manipulated in such manner that segregation occurs.

E. Minimum temperatures under which asphaltic concrete pavements may be constructed shall be as stipulated in the governing standards.

3.5 REPAIR OF DEFECTS

A. Contractor shall remove and replace defective areas by cutting to the full depth of the course. Cuts shall be made perpendicular and parallel to the direction of traffic with edges vertical. Pavement shall be removed 12 inches beyond the edge of the disturbed subgrade or pavement, whichever is greater. If the excavation is within three feet of an existing joint or cut, at lane line, or roadway edge the surface shall be extended to that point.

B. A tack coat shall be applied to all exposed surfaces. The area shall be filled with fresh hot asphaltic concrete mix in lifts of the same depths as the adjacent area, then compacted by rolling to specified surface density and smoothness. Tack coat shall be as specified in Section 2204 of KCMO Standard Construction and Material Specifications.

3.6 TEMPORARY SURFACE

A. Cuts in roadway shall be plated or temporarily filled and capped with cold mix asphalt when work is not be performed.

3.7 CLEANING

A. After completion of paving operation, all areas shall be cleaned of excess spilled asphalt materials to the satisfaction of Engineer.

3.8 PROTECTION

A. In addition to the requirements for protection stipulated in the governing standards, Contractor shall protect all adjacent concrete and masonry so that no damage will occur as the result of subsequent construction operations. All damage or discoloration shall be repaired to the satisfaction of Engineer before final acceptance by Owner.

B. Special care shall be taken to prevent tack or other asphalt materials from spraying or splashing. Adjacent construction shall be protected by covering with suitable fabric or paper.

End of Section

SECTION 02522 - CONCRETE SIDEWALK, CURB, AND GUTTER

PART 1 - GENERAL

1.1 SCOPE

A. This section covers the construction of concrete sidewalks, curb and gutter. This section also covers the reconstruction of concrete sidewalks, curb, and gutter.

B. Subgrade preparation shall be as indicated in the Excavation and Fill for Structures section, unless otherwise specified in the governing standards or herein.

1.2 GENERAL

A. All existing sidewalks, and curb and gutters disturbed or damaged during construction of new work, or indicated on the Drawings to be demolished and replaced shall be reconstructed.. Damaged curbs, sidewalks and/or gutters shall be to restored to their original locations, cross sections, and style unless indicated otherwise on the Drawings.

B. Contractor shall be responsible to remove, construct, reconstruct, and adjust as necessary all existing or new manhole tops, curb and gutter, and area drainage structures to match new grades as needed.

C. Governing Standards

1. Except as otherwise specified or indicated on the Drawings, materials, equipment, details, and construction methods shall comply with the applicable KCMO standards.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Except as otherwise modified herein, materials shall conform to the requirements of Section 2200 - Paving of KC KCMO standard Construction and Material Specifications.

PART 3 - EXECUTION

3.1 GENERAL

A. Curb or Curb and Gutter replacement shall be performed in accordance per Standard Drawing Number C - Curbs as shown in the drawings.

3.2 SUBGRADE PREPARATION

A. As a minimum, the top 6 inches of the subgrade shall be compacted to a 95 percent of standard proctor density at optimum moisture content as determined by governing standards. In addition, the stability of subgrades shall be such that when materials for construction are deposited on the subgrade no rutting or displacement of the subgrade by material hauling vehicles will occur. No materials shall be placed on subgrades which are muddy, frozen, or have frost, snow, or water thereon. Subgrades shall be thoroughly compacted and properly shaped before any surfacing, curb and gutter, or sidewalk materials are placed. All subgrade and surfacing shall be sloped as indicated on the Drawings, and as needed to achieve a uniform slope between new and existing surfaces. Sidewalks shall slope toward one edge.

3.3 CONCRETE SIDEWALKS

A. Concrete shall be placed, vibrated, and finished as described in the governing standards.

B. One-half inch expansion joints shall be provided where sidewalks abut a curb, structure, existing sidewalk, at changes in directions, and at intervals of not more than 40 feet . Expansion joints shall be filled to within 3/4 inch of the surface with bituminous expansion joint material, and then filled flush to the surface with self-leveling caulking in accordance with the Joint sealant section. The joint sealing compound shall be finished slightly concave, and shall not be allowed to overflow the joint.

C. Concrete sidewalks shall be screeded to the proper elevation and contour. All aggregates shall be completely embedded in mortar. Screeded surfaces shall be given an initial float finish as soon as the concrete has stiffened sufficiently for proper working. Any piece of coarse aggregate which is disturbed by the float or which causes a surface irregularity shall be removed and replaced with mortar. Initial floating shall produce a surface of uniform texture and appearance, with no unnecessary working of the surface. A second floating at the time of initial set shall follow initial floating.

D. Floated surfaces shall be given a light broom finish, using a horsehair broom, to provide a nonslip surface. Brooming shall be at right angles to the length of the curb, walk, or gutter.

E. New sidewalks shall be edged to match existing sidewalks.

F. Sidewalks shall be edged using a 3 to 4 inch wide edging tool with a 1/8 inch corner radius. Edger lap marks at corners of each slab shall be carefully removed. False joints shall be provided at right angles to the length of the walk, using a grooving tool with 1/8 inch radius and a depth of 1.2 inch . The finished edge on each side of the joint shall be the same width as the edging tool used. False joints shall divide each sidewalk into square sections.

G. The finished surface of all sidewalks shall be neat in appearance, shall be sloped to drain, and shall not pond water.

H. The finished concrete shall be cured and protected as stipulated in the governing standards.

3.4 CONCRETE CURB AND GUTTER

A. New concrete curb and gutter shall be as installed per KCMO standard detail and specified herein. Replacement concrete curb and gutter shall match the existing curb and gutter. Unless otherwise authorized by Engineer, adjacent and enclosed curbs, drainage structures, and gutters shall be placed before placement of pavement sections.

B. Expansion and contraction joints shall be formed at right angles to the alignment of the curb and/or gutter and to the depths as specified, as indicated on the Drawings, and in conformance with the governing standards. One half inch wide expansion joints with 2' dowels shall be placed full depth using a premolded expansion joint material, cut to the configuration of the full size of the section, being secured so that they are not moved by depositing, compacting or finishing the concrete at these joints. The edges of these joints shall be rounded by an edging tool of 1/8 inch radius.

C. Expansion joints shall be placed at the beginning and end of radii, where curbs and gutters abut structures, and at intervals of approximately 150 feet .

D. Contraction joints shall be a minimum of 1 inch deep on all sides, shall be spaced at approximately 10 foot intervals, and shall be formed by a 1/8 inch thick steel template, cut to the configuration of the section. These templates shall be secured so they are not moved by depositing, compacting or finishing the concrete.

E. Unless otherwise indicated on the drawings, and as soon as the concrete has hardened sufficiently, the templates shall be removed from all contraction joints. The edges of the joint shall be rounded with an edging tool having a maximum radius of 3/8 inch .

F. All expansion and contraction joints shall be filled flush to the surface with joint sealing compound. The joint sealing compound shall be finished slightly concave and shall not be allowed to overflow the joint.

G. Forms

1. Forms shall be in conformance with the governing standards. All forms shall be in good condition, with not more than 1/8 inch variation in horizontal and vertical alignment for each 10 feet in length. Side forms shall have a depth at least equal to the edge thickness of the concrete being formed. The forms shall be set true to line and grade and shall be adequately supported to stay in position while depositing and consolidating the concrete. Forms shall be designed and constructed so as to permit their removal without damage to the concrete.

H. Finishing

1. Curb and gutter shall be finished to the shape indicated on the Drawings. After the forms have been removed, all exposed edges shall be rounded, using an edging tool with a 1/8 inch corner radius. Exposed surfaces shall be float finished and given a light broom finish applied at right angles to the curb at the time of initial set, using a horsehair broom. Mortar or dryer shall not be used to remove imperfections. In all cases, the resulting surface shall be smooth and of uniform color with all rough spots, projections, and form

stakes removed. No plastering of the concrete will be allowed. The finished curb shall have a true surface, free from sags, twists, or warps; shall have a uniform appearance; and shall be true to the original lines, grades, and configurations indicated on the Drawings.

3.5 PROTECTION

A. In addition to the requirements for protection set forth in the governing standards, Contractor shall protect all adjacent concrete and masonry so that no damage will occur as the result of subsequent construction operations. All damage or discoloration shall be repaired to the satisfaction of Engineer before final acceptance by Owner.

B. Special care shall be taken to prevent bituminous materials from spraying or splashing. Adjacent construction shall be protected by covering with suitable fabric or paper.

C. Only white curing membranes shall be permitted and shall conform to the standard specification section 2200.

3.6 SITE REQUIREMENTS

A. Three (3) working days after all subsurface work has been completed, the contractor shall initiate the following restoration work: seed and/or sod (depending on contract requirements and/or written agreements with property owners), replacing concrete sidewalks, curbs, gutters, driveways and other surfaces impacted by the Work.

B. Three (3) working days after the placement of concrete, the Contractor shall conduct cleanup operations related to the completed concrete work as follows:

1. Removal of forms, backfilling of the form excavation and debris removal from streets, sidewalks and parkway areas shall be accomplished within three (3) working days after the concrete placement. The backfilled areas within one foot of new concrete shall not be compacted until the concrete has cured a minimum of five (5) days.

2. Five (5) working days after the concrete is placed, the Contractor shall complete all joint caulking, pavement restoration, seeding and sodding. If construction is being performed during periods other than designated seeding and sodding seasons, all locations without turf cover shall be completed within ten (10) working days after the beginning of the next seeding and sodding season.

3. If cleanup, backfilling, sodding, joint caulking or pavement restoration is not accomplished within the above limits, all tear-out and installation operations shall cease until these items are finished. Proceeding without these items being completed is at the sole discretion of the City.

4. All excavated material shall be removed and disposed of by the Contractor so that the grounds will be left in equal or better condition than its original state. Any deficiency in the quantity of material for filling depressions caused by settlement shall be supplied by the Contractor.

5. Surplus materials, equipment, tools, temporary facilities and structures shall be removed by the Contractor; all debris shall be hauled away by the Contractor and the construction site shall be left in equal or better condition than its original state. Payment of completed items on the Schedule of Values shall be subject to the completion of the cleanup operations.

6. Tear-out and installation shall not begin if unfavorable conditions for concrete placement are forecast for the next day.

7. All cleanup operations, as stated above, shall be completed five (5) working days after concrete placement.

End of Section

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SECTION 02610 - PRECAST CONCRETE VAULTS

PART 1 - GENERAL

1.1 SCOPE

A. This section covers the furnishing and installation of precast concrete vaults. Precast concrete vaults shall be constructed complete with covers, steps, fittings, and other appurtenances, in accordance with the details on the Drawings.

B. Trenching, bedding and backfill are covered in the Excavation and Fill for Structures section.

1.2 GENERAL

1.3 Except as modified or supplemented herein, the precast concrete vaults shall conform to all applicable provides of ASTM C858 and C913. Design of the vault shall be in accordance with the latest edition of AASHTO Standard Specifications for Highway Bridges and ACI 318.

A. Precast vaults shall conform to the dimensional requirements of the Drawings. In the event of a conflict between dimensions indicated on the Drawings and specified herein, the Drawing dimensions shall govern.

1.4 SUBMITTALS

A. Submit shop drawings and product data for all precast concrete structures, together with complete data covering all materials proposed for use, in accordance with the Shop Drawing Procedure section. The drawings and data shall include, but shall not be limited to, the following:
   1. Shop drawings showing precast concrete structure geometry, details of joints, details of fittings and specials, and reinforcing.
   2. Product data for materials and products.
   3. Design calculations sealed and signed by a civil and structural engineer registered in Missouri.
   4. Test reports.

1.5 DESIGN REQUIREMENTS

A. Calculations and Drawings

B. Design of precast vaults shall be the responsibility of Contractor. Design calculations and fabrication drawings for each rectangular vault shall list all design loads and loading combinations used in the design and shall bear the seal of a Professional Engineer registered in the State of Missouri.

C. Design Standards

D. Design of precast vaults shall be in accordance with ASTM C890, AASHTO Standard Specifications for Highway Bridges, ACI 318.

E. Requirements per the North Kansas City Levee District and United States Army Corp of Engineers.

F. Performance Requirements

G. Precast concrete vaults shall be watertight. All joints shall be sealed to provide zero leakage at 20 feet of water; external pressure. For floatation a minimum factor of safety of 1.5 shall be provided for normal operating conditions and 1.1 for extreme (flood) conditions.

H. Design Loadings

I. Precast concrete vaults shall be design to resist the pavement and soil weight, and at-rest lateral earth pressure, H20 loading, and hydrostatic uplift and lateral forces, per the geotechnical report without becoming buoyant with a water elevation at the 500 year flood elevation (760.00).

J. Design loads for precast concrete vaults shall comply with the requirements of ASTM C857 for utility structures. Minimum loading requirements shall be as follows:

Live Loads	AASHTO HS-20 loading, distributed through soil in accordance with ASTM C857 or ASTM C890.
Lateral Soil Loads	Equivalent fluid pressure under active condition.
	75 pcf (unsaturated)
	100 pcf (saturated)
Dead Loads	Concrete: 145 pcf
	Soil dead (downward on roof): 120 pcf.
	Soil weight (flotation): 100 pcf
Additional Load Cases	ASTM C857 or ASTM C890 for all cases not listed above.

1.6 Concrete cover requirements shall be the following with no minus tolerance:

Interior Surfaces, minimum, inches	1-1/2
Exterior Surfaces, minimum, inches	1-1/2

1.7 QUALITY ASSURANCE

1.8 Design, fabrication, delivery, and erection of precast units shall be by a precast manufacturer specializing in products similar to units required for this project. Precast concrete manufacturer shall have been regularly and continuously engaged in the manufacture of similar units for at least five years.

A. Precast manufacturing plant shall participate in a plant certification program. The manufacturer shall hold a current certification dated no older than (6) months in one or more of the following:

1. PCI Plant Certification Program: Certification shall be category B1.

2. NPCA Plant Certification Program.

1.9 DELIVERY, STORAGE, AND HANDLING

1.10 Precast concrete vault sections shall not be delivered to the job until representative concrete control cylinders have attained strength of at least 80 percent of the specified minimum 28-day strength.

A. Precast concrete vault sections shall be handled carefully and shall not be bumped or dropped. Hooks shall not be permitted to come in contact with joint surfaces. Precast sections may be provided with lighting notches on the inside faces of walls to facilitate handling. Lifting notches shall be not more than 3 inches deep, holes extending through the wall will not be acceptable.

PART 2 - PRODUCTS

2.1 MATERIALS

Cement	ASTM C150, Type I. Water-cementitious materials ratio shall not exceed 0.40. Alternative materials proposed by Contractor that will provide equivalent performance may be submitted subject to review and acceptance by Engineer.

Fly Ash	Fly Ash shall conform to ASTM C618 TypeF, except loss on ignition shall no exceed 4 percent. Fly ash content shall be 20-25 percent by weight of the total cementitious material
Aggregates	Aggregates shall conform to ASTM C33 (3/4 inch maximum). Aggregates shall be tested for alkali-silica reactivity and tested in accordance to ASTM C1260 or ASTM C1567.
Joints	ASTM C913
Reinforcement	ASTM C913
Nonshrinking Grout	L&M "Crystex", BASF "Masterflow 713 Plus" or “Masterflow 928”, Sika “SikaGrout 328”, Hilti “CB-G PG Precision Grout”, or Five Star Products "Five Star Grout".
Mastic	Ram-Nek Flexible Plastic Gasket and Primer by K.T. Snyder Company, or equal.
Coal Tar Epoxy	High-build coal tar epoxy; Ameron "Amercoat 78HB Coal Tar Epoxy", Carboline "Bitumastic 300M", or Tnemec "46H-413 Hi-Build Tneme-Tar".
Manhole Steps	
Steel-Reinforced Plastic Manhole Steps	H. Bowen "BOWCO No. 93813" or M.A. Industries "PS2-PF"; 1/2 inch deformed steel bar, ASTM A615, Grade 60 minimum, totally encapsulated in copolymer polypropylene, ASTM D4101.
Composite Sheet Dampproofing	Self-adhesive rubberized asphalt/polyethytlene waterproofing material with a minimum thickness of 1/16 inch. Grace “Bituthene 3000 and Bituthene Low Temperature” or equal

2.2 VAULT MANUFACTURER

A. The vault sections shall be manufactured in accordance with ASTM C913 excepted as modified in this Section.

B. Configurations:

1. Size: As shown on the Drawings

2. The vaults shall include knockouts for pipe penetrations.

C. Curing

1. Concrete shall be water or steam cured. Membrane curing compound will not be acceptable.

D. Marking

1. Each section of the vault shall be marked in accordance with ASTM C913. Identification of specials to show the location in the line shall be plainly and permanently marked thereon.

E. Testing

1. All testing shall conform to ASTM C913. Copies of reports covering all tests made by the testing laboratory shall be submitted for review. All test shall be made at the CONTRACTOR'S expense. The Owner reserve the right to sample and test any vault section after delivery and to reject sections represented by any sample that fails to comply with the specified requirements.

F. Manufacturers

1. Manufacturers shall be an KCMO approved Pre-Cast Concrete Product Supplier. Manufacturers shall be Rinkers Materials, Pretech Corporation, Reliable concrete Products, Inc, or American Concrete Products Co.

G. Vault Hatches

1. Access hatches shall be provided and installed where indicated on the Drawings and as specified herein and included the schedule below.

Floor Access Doors and Hatches Schedule				
Tag Number	H101*	H102*	H103*	H104*
Location	Valve Vault (typical to VW2-5R)			
Nominal Size, inches (WxL)	3’-0” x 3’-0”	2’-6” x 4’-0”	3’-0” x 6’-0”	2’-0” x 2’-0”
Design loading, minimum	HS20	HS20	HS20	HS20
Material	Aluminum	Aluminum	Aluminum	Aluminum
Finish	Mill	Mill	Mill	Mill
Number of Leaves	Single	Single	Single	Single
Cover Style	Diamond Pattern	Diamond Pattern	Diamond Pattern	Diamond Pattern
Leaf Gasket	Yes	Yes	Yes	Yes
Frame Drainage	Yes	Yes	Yes	Yes
Hinges, Operators, and All Hardware	316 Stainless	316 Stainless	316 Stainless	316 Stainless
Safety Grating	Yes	Yes	Yes	Yes
Ladder Extension	No	Yes	No	No
*Hatch is typical of five locations. Refer to the drawings.				

2. All surfaces of aluminum which will be in contract with concrete or mortar when installed shall be given a heavy coat of epoxy enamel. All paint shall be dry and hard when the coated parts are shipped, assembled, or installed.

3. Door and hatch frames shall be provided with anchorage devices into the concrete slab. Channel frames shall be ¼ inch thick with cross section area large enough to allow adequate water drainage. A 1-1/2 inch drainage coupling shall be located in the channel frame. The frame shall be designed to empty through the coupling to grade.

4. Frames shall have a neoprene door cushion unless a specific door model without a cushion is specified. The sizes shall be as indicated on the Drawings. The 1/4 - inch thick diamond pattern aluminum plate door shall be designed to HS20 loading with a maximum deflection of $1/150^{th}$ of the span.

5. Hatches shall be supplied with lifting operators and hold-open devices. All doors shall automatically lock in the vertical position by means of a hold-open arm with release handle. A snap lock with a gasketed cover plug and removable turn handle shall be provided. The operators shall provide for smooth, easy and controlled door operation throughout the entire arc of opening and closing. Operation shall be affected by temperature.

6. Fall protection grating panels shall be provided on doors and hatches. The panels shall be aluminum or fiberglass grating panels designed to support a 300 psf loading. Panels shall be hinged along on edge and provided with a positive latch to maintain unit in an upright position. Provision for locking the panel in place shall be provided. All hardware shall of a non-corroding material.

7. The hatches shall be as manufactured by Halliday Products or Bilco Company. The manufacturer shall guarantee against defects in material or workmanship for a warranty period of not less than 5 years.

2.3 FINISHES

A. Normal plant formed finishes shall impart a smooth finish to the concrete. All precast section wall surfaces shall be smooth and free of holes, voids, and bug holes deeper than 1/4 inch or larger than 1 inch in any direction in the plane of the wall face. In addition, all surfaces shall be free of ridges, fins, or form tie component projections. All holes larger than 1/2 inch shall be patched with non-shrink grout. Surfaces to receive dampproofing or other finishes shall be corrected prior to application.

2.4 DAMPPROOFING

A. The exterior surfaces of precast vaults shall be dampproofed by the vault manufacturer prior to delivery to the site. With the exception of the interiors of sump pump pits, no

vault interior dampproofing is required. Exterior surfaces of precast vaults shall be coated with a minimum of 14 mils dry thickness of coal tar epoxy. If the shop coating is damaged during delivery, storage, or construction, a touchup coat shall be applied and allowed to dry prior to backfilling.

2.5 ACCESSORIES

A. Each vault shall be provided with the accessories indicated, specified, or required for proper function.

PART 3 - EXECUTION

3.1 INSPECTION

A. Precast concrete vault s sections shall be inspected when delivered and all cracked or otherwise visibly defective units, such as but not limited to: honeycombed, open texture, damaged end where such damage could prevent making a satisfactory joint, at the sole discretion of the Owner, shall be rejected. Inspection of precast concrete vaults shall comply with ASTM C1037.

3.2 EXCAVATION AND BACKFILL

A. Section 022000 as applicable.

3.3 CONSTRUCTION

A. Precast concrete structures shall not be installed in water, nor under unsuitable weather or trench conditions.

B. Vaults

1. Construct at locations and to dimensions indicated on the Drawings.

2. Foreign material shall be prevented from entering the structure during installation. No debris, tools, clothing, or other materials shall be placed therein. The interior of the structures shall be thoroughly cleaned before installation and shall be kept clean until the work has been accepted. All joint contract surfaces shall be kept clean until the joint is completed.

C. Bases

1. The subgrade materials shall be excavated to undisturbed earth and to a uniform elevation which will permit at least 4 inches of CLSM, as specified in the Excavation and Fill for Structures section, to be installed and compacted. The surface of the CLSM shall be carefully graded and the base section accurately set so that connecting pipes will be on proper line and grade. The elevation of the CLSM shall be adjusted until proper grade and alignment of the base section has been attained.

2. No wedging or blocking under precast concrete bases will be permitted.

D. Riser Sections and Precast Concrete Adjusting Rings.

1. All mating precast sections shall be provided with a rubber or mastic gasket to seal joints between sections and rings. Mastic gaskets shall be used only at temperatures recommended by the manufacturer. Lifting notches in vault walls shall be filled with nonshrinking grout.

3.4 ERECTION AND INSTALLATION

A. Installation of precast concrete vaults shall comply with the requirements of ASTM C891. Precast concrete vaults shall be lifted and supported at designated lift points by the precast manufacturer and in accordance with the requirements of PCI MNL-120.

B. Sections shall be laid to the lines and grades indicated on the Drawings. Batter boards, laser beam equipment, or surveying instruments shall be used to maintain alignment and grade. At lease one elevation measurement shall be made on each box section.

3.5 LADDER

A. All vaults shall have a ladder installed under a hatch as shown and detailed on the drawings.

3.6 PAINTING

A. Perform field painting of hatches and cover plates as specified in the Protective Coating section.

B. Apply coal tar coating to the exterior surfaces of the completed structures that will be covered below grade.

3.7 CONNECTING PIPING

A. Install joints in the pipe on exterior not closer than 3 feet from structure walls. Lay pipes entering structures on the specified bedding material.

B. The connecting pipe shall be carefully adjusted to proper line and grade, and the bedding material shall be compacted under the haunches and to the spring line of the pipe for a distance of at least 6 feet from the vault wall and to at least the minimum trench width. The pipe shall be installed in the resilient connector or modular casing seal prior to backfilling outside the vault and shall be resealed after completion of the vault and backfill. All visible leakage shall be eliminated.

C. Install a link seal to close the space between the outside diameter of pipes and conduits and the inside face of the wall opening in the precast sections.

3.8 JOINTING

A. All joint preparation and jointing operations shall comply with the instructions and recommendations of the precast concrete structure manufacturer.

B. Joints with flexible joint sealant shall be coated with the recommended adhesive, and the joint sealant shall be positioned in accordance with the manufacturer's installation instructions. Joints shall be pulled together with sufficient force to uniformly fill and seal the annular space in the joint. Joints shall not be made when adverse weather conditions may prevent proper sealing, nor when the temperature of the pipe and sealing materials is too low to achieve proper sealing.

C. Joints shall transfer all forces calculated to resist the loads listed in the Basis of Design paragraph.

D. Joints in the top slab section shall be sealed watertight with composite sheet dampproofing material. Concrete shall be allowed to cure in accordance with the membrane manufacturer's recommendation before membrane damproofing is applied. Concrete shall be prepared to receive the damproofing material as recommended by materials manufacturer. Membrane shall be installed in accordance with manufacturer's recommendations including the recommended primer.

3.9 HATCHES AND COVERS

A. Install hatches and covers on top of structures to positively limit infiltration of surface or groundwater into structures. Structures shall be set 12-inches above ground surface, unless otherwise shown or directed. Drain couplings provided with hatch frame shall be piped to drain into vault sump.

End of Section

SECTION 02670 - WATER WELLS

PART 1 - GENERAL

1.1 SCOPE

A. The work included under the provisions of this section shall consist of the complete construction of four replacement wells designated at Vertical Well Nos: 2-R, 3-R, 4-R, and 5-R and all work appurtenant thereto.

1.2 GENERAL

A. Wells shall be of the gravel wall type provided with a permanent inner casing and continuous slot screen.

B. Each well shall be developed to its maximum efficiency with the least possible head losses due to the well screen, and is anticipated to produce, without excessive drawdown, the expected capacity of each well under normal summer operating conditions is below:

Well No.	Gallons per Minute (gpm)	MGD
2-R	3,125	4.5
3-R	1,240	1.78
4-R	2,980	4.29
5-R	2,695	3.88

C. Well construction shall conform to all applicable requirements of the Missouri Department of Natural Resources.

D. All elevations are approximate. Contractor shall verify locations of the test borings and their elevations during construction. Vertical wells shall be placed within 5 feet of test borings.

1.3 SUBMITTALS

A. Each Bid submitted shall be accompanied by complete descriptive data covering the drilling, developing, and pumping equipment the Contractor intends to use, together with complete information covering the methods the Contractor proposes to use to accomplish the work to be performed.

B. The Contractor shall submit a list of not less than five installations of wells having an equal or greater diameter of screens and casings completed by Contractor in the past 5 years and shall certify the accuracy of the list.

C. Complete specifications, data, and catalog cuts, or drawings covering the fabricated items furnished under this section shall be submitted in accordance with the procedure set forth in the Submittals Procedures section.

PART 2 - PRODUCTS

2.1 MATERIALS.

A. Materials shall be new and conform to the following requirements.

B. Casings

1. The casing shall be steel not less than 36 inches OD by 0.500 inches thick, extending from the top of the screen to the elevation indicated on the drawings.

2. Casings shall be fabricated from steel conforming to ASTM A283, Grade B or C, with maximum carbon content of 0.30 percent and maximum manganese content of one percent, or to ASTM A139, Grade B. Fabrication shall conform to AWWA C201 or C202. Joints shall be welded and watertight.

C. Pitless Adapter Unit

1. The pumping unit shall be furnished with pitless unit as indicated on the drawings.

2. The pitless unit shall be similar to a Monitor, as manufactured by Baker Manufacturing Company or equal. The pitless unit shall be shop fabricated from point of connection with the well casing to the unit cover and shall be of watertight construction. The connection to the lateral discharge from the pitless unit shall be mechanical joint. Materials used in the fabrication of the pitless unit shall be durable and compatible with steel casing to prevent excessive corrosion. The pitless unit shall be designed with the following:

Well Connection	36” Welded
Pitless Case Size	38” O.D.
Vent Tap size	2”
Conduit Tap Size	2”
Drop Pipe Connection	Per pump requirements
Discharge Connection	Mechanical Joint, size per Drawings
Discharge Pipe Centerline Bury Depth	6 feet below grade
Submersible Junction Boxes	2 EA, NEMA 6P

a. Properly sized for a 36-inch-well casing
b. Black upper case coated with manufacturer's standard coating
c. Watertight well cap with the sealed conduit connection shall be provided. Adapter shall be configured such that the well cap can be removed without disconnecting the pump power supply and control cables.
d. Spool assembly shall be constructed to support the pump, motor, and pump column.
e. Protection screened well vent with 16 mesh stainless steel screen, or equivalent shall be provided.
f. Spool assembly shall be equipped with a hold-down pipe and mechanism and lift out pipe and bail which serves a pulling device. The device shall be designed to support the weight of the pump, motor, drop pipe, cable, and other accessories when pulling or setting the pump, with a substantial factor of safety. The hold-down mechanism shall be designed to resist hydraulic thrust from the pump and water.
g. The unit shall be designed to accept drawdown tubing and fittings to be permanently mounted internally.
h. Spool shall be provided with passage for all cable required.
i. Access to disinfect the well shall be provided.
j. Waterproof type junction box for conduit connection shall be provided.
k. The unit shall be frost proof.
l. A flanged upper extension to extend the pitless unit four feet above the 100-year floodplain elevation per MDNR requirements.
m. Submersible junction boxes shall be a minimum 90 degrees apart from one another below. Refer to Section 16050 – Electrical for junction box requirements.
n. The following spare parts and accessories shall be furnished in substantial boxes with identifying labels and delivered to project site, as follows:

Spare Parts	Quantity
Spool O-rings	2 rings per pitless unit
Flange Gaskets	1 per pitless unit

D. Permanent Well Pump and Motor

1. The well pump shall be designed in accordance with Submersible Well Pumps section.

E. Pump Column

1. Contractor shall coordinate pump column details with the Submersible Well Pump manufacturer. The pump column shall be provided by the Contractor. Minimum diameter of pump column and length shall be as specified in Submersible Well Pumps section.

F. Screens

1. Well screens shall be continuous slot, wire-wound construction as manufactured by Johnson or Nagaoka or equal with flush joint construction. Screens shall be fabricated from AISI Type 304 stainless steel with an open intake area equivalent to or greater than Johnson Hi-Flow screen. The outside diameter of the screen shall be not less than 36

inches. The vertical interval of each screen shall be as indicated on the drawings unless otherwise directed by the Owner.

2. Each screen or members and elements thereof shall be of adequate strength and thickness to meet the required service conditions. The width of screen openings shall be as indicated in the table below or as required to develop the well to its maximum efficiency and shall be acceptable to the Engineer. All members and elements between slots shall be of adequate section and strength to safely withstand all loads and stresses to which they may be subjected. The screens shall have sufficient strength to safely support vertically the load imposed thereon by the casing or a suitable method acceptable to the Engineer shall be devised to support the casing independent of the screen. Screen sections shall be fabricated by welding all joints and points of contact of assembled parts. Unless otherwise authorized by the Engineer, all joints between screen sections shall be securely welded. Details of such joints shall be acceptable to the Engineer.

Vertical Well	2R	3R	4R	5R
Width of Screen Opening (in)	0.15 (Upper) 0.15 (Upper)	0.100	0.15 (Upper) 0.12 (Lower)	0.12

G.

1. The end of the screen section in each well shall be tightly sealed by means of a stainless-steel plate not less than 3/8 inch in nominal thickness, attached to the screen by means of a continuous weld around its entire circumference. This plate shall serve the dual purpose of closing the bottom of the well and supporting the casing and screen assembly.

H. Gravel Pack.

1. Well grout shall be comprised of Portland cement and water in the proportion of no more than six gallons of water per 94-pound bag of cement.

2. All material used for construction for the gravel wall around the screen and inner well casing shall be cleaned, well rounded particles of 95 percent siliceous material which has been thoroughly cleaned of all silt, dust, and other foreign matter. All gravel used shall be screened and processed to provide a material of size and gradation required to guarantee that the completed well(s) will produce the specified water yield with not more than 2 ppm of sand by weight. Gravel gradation shall conform to the following requirements and the coefficient of uniformity shall not exceed 2.5:

Well 2-R

Upper Filter Pack		Lower Filter Pack	
Sieve Opening, inches	% Passing	Sieve Opening, inches	% Passing
0.250	92-100%	0.250	92-100%
0.219	82-98%	0.219	82-98%
0.197	62-78%	0.197	62-78%
0.189	52-68%	0.189	52-68%
0.187	50-66%	0.187	50-66%
0.179	42-58%	0.179	42-58%
0.165	22-38%	0.165	22-38%
0.150	5-10%	0.150	5-10%

*Contactor to select and place buffer sand between two filter packs, to be confirmed by Engineer.

Well 3-R

Sieve Opening, inches	% Passing
0.228	92-100%
0.187	88-100%
0.173	82-98%
0.162	67-83%
0.157	52-68%
0.152	42-58%
0.132	23-39%
0.131	22-38%
0.100	5-10%

Well 4-R

Upper Filter Pack		Lower Filter Pack	
Sieve Opening, inches	% Passing	Sieve Opening, inches	% Passing
0.276	92-100%	0.234	92-100%
0.234	82-98%	0.191	82-98%
0.213	67-83%	0.187	78-94%
0.195	52-68%	0.178	67-83%
0.187	44-60%	0.167	52-68%
0.185	42-58%	0.161	42-58%
0.166	22-38%	0.150	22-38%
0.150	5-10%	0.132	8-24%
		0.120	5-10%

*Contactor to select and place buffer sand between two filter packs, to be confirmed by Engineer.

Well 5-R

Sieve Opening, inches	% Passing
0.236	92-100%
0.203	82-98%
0.187	67-83%
0.180	52-68%
0.173	42-58%
0.158	22-38%
0.132	7-23%
0.120	5-10%

I. Well Cement Grout

1. Cement grout placed in the annular spaces, as indicated on the drawings, shall be mixed and placed in accordance with the requirements of the Missouri Department of Natural Resources.

2. The materials used for the well grout shall be as follows:

Portland Cement	ASTM C150, Type 1.
Sand	ASTM C33, fine aggregate, clean, well graded, natural sand.
Pea Gravel	ASTM C33, coarse aggregate, 90 percent passing a 3/8-inch sieve, 90 percent retained on a No. 4 sieve.
Water	Clean and free from deleterious substances.

3. Grout shall be job-mixed in a mechanical mixer in the proportions not to exceed 2 parts by weight of sand to 1 part of cement. Water shall be limited to the least amount necessary to produce a flowable grout. Whenever the space to be grouted has a thickness of 2 inches or more and free placement of grout will not be hampered, a maximum of 3 parts of pea gravel may be added for each part of portland cement.

4. Minimum grout cure times shall meet MDNR well constructions standards for Portland Type 1 Cement, which is 72 hours minimum.

J. Dissimilar Metal Adapter

1. The dissimilar metal adapter shall have a 36 inch outside diameter. The design materials shall be 108-inches of 36” x 0.750 wall x API 5L – A53B and 4 inches of 36” x .375 wall x A312M 304 SS. These shall be aligned together to meet minimum standards of the above referenced ASTM pipe requirements. These will be connected using mixed inert gas (MIG) welding with a bead both inside and outside. Both ends of the assembly shall have ae 30-degree bevel. This adapter shall be manufactured by Johnson Screens, Roscoe Moss, or approved equal.

K. Bentonite Seal

1. The bentonite seal, intended to keep grout from entering the filter pack, shall consist of hydrated granular or pelletized sodium montmorillonite, and shall meet the requirement of the Missouri Department of Natural Resources. Material shall be furnished in sacks of buckets from a commercial source and shall be free of impurities which adversely impact the groundwater quality.

PART 3 - EXECUTION

3.1 Drilling Method

A. The Contractor shall be responsible for determining the location of each of the five (5) test borings that were drilled and sampled, and each replacement well shall be drilled and installed within 5 feet of that location. The drilling location for each well shall be staked by the Contractor, and a field survey will be performed to determine the coordinates and ground elevation of each new vertical well location.

B. No use of drilling mud or other bentonite-type drilling additives shall be used in the drilling process unless otherwise permitted by the Engineer.

C. The Contractor shall submit a work plan detailing the means and methods for drilling and installing high-capacity vertical wells in this area for approval by the Engineer. The three (3) acceptable drilling methods for Engineer approval are reverse circulation rotary, bucket auger, and cable tool. The borehole diameter for the 36-inch diameter well casings and screens shall be between 44 and 48 inches.

D. Depending on the drilling method, the Contractor shall take care to provide a continuous and sufficient supply of water so that the drill hole will be kept full of water at all times during the entire drilling operation. The Contractor shall be prepared to use temporary casing or other approved means to keep the hole open during construction. Temporary casing used during the drilling shall be removed and recovered by the Contractor. Temporary casing shall be recovered without causing caving of the drilled hole.

E. If reverse rotary method is used, the water may be recirculated through a temporary sump of adequate size and depth to remove the drill cuttings from the water. Should the drilling water become heavy with fines and mud, the Engineer will require the Contractor to pump the drilling fluid to waste and refill the pit with clean water.

F. The casing and screen sections shall be installed as indicated on the drawings.

G. The wells shall be constructed round and true to line. After drilling is completed, the casing and screen shall be installed in the well. Care shall be taken that the closed end of the casing has a uniform bearing on the bottom of the hole, that the casing is centered in the borehole or construction casing, and that the screen is set plumb regardless of any out-of-plumb condition of the borehole walls. Casing centralizers, designed to hold the screen and casing in the center of the drilled hole shall be utilized to ensure plumbness and alignment during the installation of the well materials. Plumbness and alignment testing shall be performed, and the testing shall conform to AWWA A100-20, Section 4.7.9. The contractor shall furnish to the engineer the plumbness and alignment test results for approval before the well is completed as permanent. If it is determined that the well does not meet the standards provided within AWWA A100-20, Section 4.7.9, it shall be redrilled at no cost to the owner.

H. Gravel shall be placed in the annular space between the screen and casing and the side of the hole from the bottom of the well up to the depth below ground surface indicated on the drawings. Gravel shall be placed with a tremie.

I. During the placing of the gravel, the elevation of the bottom of the tremie pipe shall be so controlled that at no time will the bottom of the pipe be more than 5 feet above the top of the gravel already deposited in the well. All operations of handling and placing the gravel shall be regulated to prevent segregation of sizes of the gravel particles.

J. The annular space between the casing and the drilled hole directly above the gravel pack shall be filled with a mixture of 75 percent local road sand and 25 percent bentonite clay grout as indicated on the drawings. Baroid's Holeplug or granular sodium bentonite may be used, provided it meets the requirements of a plugging sodium bentonite clay as established by the Missouri Department of Natural Resources. The sand and bentonite mixture shall be placed in the annulus through a 3-inch tremie pipe with the bottom of the pipe not more than 10 feet above the point where the mixture is being placed. The water used to wash the mixture down the tremie pipe shall contain a chlorine concentration of 400 ppm obtained by the addition of sodium hypochlorite. Calcium hypochlorite is not an acceptable substitute for sodium hypochlorite.

K. The remaining annular space between the casing and the hole wall shall be filled with cement grout from finished grade to 30 feet depth below ground surface. Grout shall be placed with a tremie similar to the gravel pack, when placed below water level.

L. Portable pits are required for rotary wash boring method. Excavated pits are not allowed.

M. Mud rotary drilling and other methods are not permitted in the surficial fine-grained blanket materials. Mud rotary drilling and other methods may only be used once the blanket materials have been adequately protected from drilling fluids by casing or augers fitted with O-rings.

3.2 DEVELOPMENT.

A. Each well shall be fully developed to break down and remove drilling fluids and very fine grain sediments that are in the aquifer, filter pack, and aquifer immediately adjacent to the well bore. If necessary, clay dispersants shall be used to break down fine particles that may have been deposited on the borehole wall during the drilling process. It is expected and required that the Contractor perform this work in accordance with accepted development practices. Proposed methods of development shall be subject to acceptance by the Engineer.

B. Each well shall be fully developed to obtain the maximum yield of water per foot of drawdown and as necessary to extract from the water bearing strata the maximum practical quantity of such sand as would tend to be drawn through the screens during the life of the well.

C. Each well shall be developed as specified below. The Contractor may suggest alternate well development techniques, which shall be submitted in a well development workplan that is subject to approval by the Engineer. The development of a well shall only be considered acceptable when the water produced has a turbidity not greater than 10 NTU and contains not more than 2 parts per million of sand by weight. Attention is directed to Appendix E of AWWA A100. Each well shall be developed as follows:

1. Stage 1 – Initial Development with Single Swab

a. The initial mechanical development shall be completed with an open-ended single swab attached to the end of the drill pipe.
b. Swabbing shall be completed to remove sediment and heavy fluids from the well casing.
c. The tool shall be moved up and down three to four times in a section of well screen while airlifting. After working the tool to the bottom of the well, airlifting shall continue until all sediment is removed.

2. Stage 2 – Development with Twin Disc Surge Device

a. Development with a pneumatically actuated twin disc surge device shall commence immediately following completion of development with a single swab.
b. The surging tool shall consist of a perforated steel pipe, 10 foot in length, fitted with rubber seals at the top and bottom. The bottom of the perforated pipe shall be capped.
c. Simultaneous airlifting and swabbing using the double-swab tool shall commence in the upper-most screened interval and proceed to the lower-most screened interval. Each screened interval shall be swabbed and airlifted in 10-foot increments until the discharge water becomes substantially clear as determined by the Engineer. Approximately 2.5 to 3 hours are anticipated for each 10-foot increment of screened well casing.
d. Development in each 10-foot increment of well screen shall include raising and lowering the double swab tool three to four times or more in a shorter section of the screened well casing as needed to produce sediment filled discharge water while airlifting continues. Air-lift swabbing shall be followed by a period of airlifting without swabbing until the discharge water clears. This process shall be repeated until water produced from the 10-foot section of screened well casing becomes substantially clear and no additional settlement of the gravel pack is observed. Upon completion, the surge tool shall be moved to the next 10-foot section of screened well casing and the process is repeated until all screened intervals have been fully developed.
e. Upon completion of mechanical development, the well shall be accurately sounded in the presence of the Engineer to determine the level of accumulated sediment in the well. The sediment level shall be recorded on the Contractor's daily activity log. All accumulated sediment shall be bailed from the well prior to installing the temporary test pump.

3. Stage 3 – Chemical Development

a. Pre-treat the well with 1,500 ppm chlorine to break down polymer that are present in most commercially available drilling mud additives. Contractor shall calculate the amount chlorine needed to achieve the required concentration.
b. Determine borehole volume and apply Nu-Well 220 dispersant polymer at the rate of 1 gallon per 500 gallons of water. Vigorously agitate by mechanical means for ½ hours per 10 feet of well screen. The dispersant polymer shall be allowed a minimum of 6 to 8 hours contact time, downhole, before being pumped out. If the dispersant solution is left in the well overnight, it shall be mechanically agitated before pumping out.

c. All chemical and dispersants shall be used in accordance with the manufacturer's instruction for use. The chemicals and dispersants must be properly treated before disposal, and disposal shall be done in accordance with all federal, state, and local regulations.

4. Stage 4 – Final Development

a. The final phase of development shall be done by use of the test pump hereinafter described. During this phase of development, the test pump should be stopped and started frequently to provide a surging action to the operation. As specified elsewhere in these specifications the test pump must be capable of pumping at the expected capacity of each well during normal operating conditions. The pumping phase of the development shall be carried on until the turbidity at the rate specified for the constant rate pumping test is within the specified limits.

b. If the water pumped from the well does not meet the turbidity requirement given above, the Engineer may require that the Contractor remove the pump and redevelop the well by use of surge block and bailer, then reinstall the pump and repeat the pumping phase of the development at no extra cost to the Owner.

3.3 TEST PUMP

A. A turbine test pump capable of pumping the expected capacity of each well during normal operating conditions shall be furnished by the Contractor and temporarily installed in each well to complete development of the wells and to conduct a final pumping test of the wells as described herein. Motive power such as a gasoline or diesel engine, or gasoline or diesel engine electric generator set (if an electrically powered pump is furnished), shall also be furnished by the Contractor. A valve shall be installed in the discharge pipe from the pump to control the rate of pumping. Flow shall be measured by a freely discharging orifice of proper dimensions installed at the end of the discharge pipe, together with a transparent plastic manometer tube, or by a calibrated propeller meter. The test pump shall be capable of operating at least 24 hours without shutdown.

3.4 PUMPING TESTS

A. Level measurements can be taken manually or via pressure transducers to record the water levels within the wells during pumping tests. If pressure transducers are used, a manual water level probe shall be used to verify the pressure transducers readings.

B. Each well shall be tested in accordance with the following procedure.

1. Step-Drawdown Pumping Tests. The well shall be allowed to recover for at least one hour before test pumping is started. During the hour immediately preceding the start of the test pumping, the static water level shall be measured every 10 minutes.

2. The pumping test shall be a step-drawdown type pumping test in which pumping rates for each well shall be:

Well 2-R		Well 3-R	
Rate	Period	Rate	Period
1,560 gpm	2 hours	620 gpm	2 hours
2,345 gpm	2 hours	930 gpm	2 hours
2,815 gpm	2 hours	1,115 gpm	2 hours
3,125 gpm	2 hours	1,240 gpm	2 hours

Well 4-R		Well 5-R	
Rate	Period	Rate	Period
1,490 gpm	2 hours	1,345 gpm	2 hours
2,235 gpm	2 hours	2,020 gpm	2 hours
2,680 gpm	2 hours	2,425 gpm	2 hours
2,980 gpm	2 hours	2,695 gpm	2 hours

The drawdown shall be measured in the well as follows:

	Frequency	Period
PUMPING	2 minutes	First 20 minutes
	5 minutes	Next 40 minutes
	30 minutes	Next 60 minutes
	5 minutes	Next 30 minutes
	30 minutes	Next 90 minutes
	5 minutes	Next 30 minutes
	30 minutes	Next 90 minutes

	Frequency	Period
PUMPING	5 minutes	Next 30 minutes
	30 minutes	Next 90 minutes
RECOVERY	2 minutes	First 20 minutes
	5 minutes	Next 40 minutes

3. Constant Rate Pumping Test.

a. A 24-hour pumping test shall be conducted on each well under the supervision of the Engineer. The constant rate pumping test shall follow the conclusion of the step-drawdown test by at least 12 hours. The Contractor shall be required to pump the well during the test for the full period without shutdown. If a shutdown occurs during the test period, the Contractor shall be required by the Engineer to repeat the test the following day without extra cost to the Owner. The flow rate for the constant rate test for each well will be selected by the Contractor, with approval by the Engineer, based on the results of the step-drawdown test for each well. During the constant rate pumping test, the pumping rate shall be maintained at the flow rate with the test pump intake set at least five feet below the estimated lowest pumping level. The discharge flow rate shall be maintained within plus or minus 5 percent of the required flow and shall be checked every ten minutes during the first hour of the test and at 30-minute intervals thereafter. The Contractor shall measure and record water levels in the well.

b. Recording of water levels shall begin one hour prior to the start of pumping and shall continue after the end of the pumping test until the static water level has recovered to its original level. If continuous recorders are not used, the frequency and interval of water level measurements shall be as follows:

	Frequency	Interval
PRECEDING PUMPING	10 minutes	1 hour
PUMPING AND RECOVERY	1 minute	0 to 5 minutes
	2 minutes	5 to 15 minutes
	5 minutes	15 to 60 minutes
	10 minutes	second hour
	30 minutes	third hour
	Hourly	to completion

c. Failure of the pump operation for a period greater than one percent of the elapsed pumping time shall require suspension of the test until the water level in the pumped well has recovered to its original level. If the water level does not recover to its original level, pump testing can resume if three successive water level measurements spaced 20 minutes apart show no rise in level.

3.5 DISPOSAL OF WATER PUMPED FROM EACH WELL.

A. During final development of each well by use of the test pump and during the period of final testing of each well, the Contractor will be required to convey the water away from the well to avoid flooding and erosion of the land in the vicinity.

B. The method of disposal shall be satisfactory to the Engineer. The Contractor shall furnish all labor, materials, and equipment for constructing ditches or laying pipelines, and the cost of all such work shall be paid for by the Contractor. All ditches dug by the Contractor shall be filled to the satisfaction of the Engineer upon completion of the work.

3.6 PROTECTION OF WELLS

A. At all times during the progress of the work, the Contractor shall protect each well in such manner as to effectively prevent either tampering with the well or the entrance of foreign matter into it.

3.7 WELL DISINFECTION

A. Disinfection of the wells shall be in accordance with the latest edition of AWWA C654. Tools, pumps, gravel, drilling equipment, and water for each well shall be disinfected by treating it with a chlorine solution containing at least 200 mg/L, prior to placement. After the well is completed and the permanent pump installed, the well shall be disinfected by adding sufficient hypochlorite solution to produce a solution with a minimum chlorine concentration of 200 mg/L.

3.8 WATER QUALITY SAMPLING

A. After disinfection, one or more samples shall be submitted to a laboratory certified by the Missouri Department of Natural Resources for analysis and the results reported to the department prior to placing the well into service. Applicable physical, chemical, and radiological characteristics shall also be determined as required by the Missouri Department of Natural Resources. Sampling shall be conducted in accordance with Missouri Department of Natural Resources.

3.9 WELL VENTS AND DRAWDOWN TUBING

A. Contractor shall provide a suitable well vent drawdown tubing of at least 1.5 inches diameter to allow a 3/4-inch diameter sounder through it and all appurtenant piping at each well. The vent shall terminate in a downturned position with the opening covered with an 18-mesh corrosion resistant screen.

B. Contractor shall provide a suitable well drawdown tubing adequately sized for the permanent level sensor and conduit through it and all appurtenant piping at each well.

3.10 CONTRACTOR'S RESPONSIBILITY

A. The Contractor shall be responsible for performing all of the work in strict accordance with these specifications. If evidence indicates that the screen or casing in the well is broken or that the well is not constructed in accordance with the specifications to the satisfaction of the Engineer, the Engineer may order that proper changes be made by the Contractor, or in the event that proper changes cannot be made, the Engineer may order the Contractor to abandon such well without cost to the Owner and to drill a new well.

3.11 WELL LOGS AND CONSTRUCTION DRAWINGS

A. The Contractor shall keep a log of the geologic materials encountered in the drilling of each well in accordance with the requirements of the Missouri Department of Natural Resources and shall furnish typewritten PDFs of such log to the Engineer on completion of the well. The Contractor shall also furnish three copies of a drawing for each well showing the depth and exact construction of the well, and giving all dimensions regarding lengths and diameters of casing and screen, size of slot openings, and other pertinent details and dimensions.

3.12 VIDEO SURVEY AND INSPECTION

A. The Contractor shall inspect the full depth of each well utilizing video based survey. The depth measurement reading shall be referenced to the top of the casing. Video survey shall have a self-continuous, clear picture showing the entire inside periphery of the constructed well. Video equipment shall be capable of passing through the screen.

B. Owner and Engineer shall be present for the closed-circuit TV inspection.

C. A continuous record of each inspection shall be recorded on portable media and submitted to the Engineer. Each survey shall be recorded and submitted on a portable media.

End of Section

SECTION 02675 - CLEANING AND DISINFECTION OF WATER PIPELINES

PART 1 - GENERAL

1.1 SCOPE

A. This section covers cleaning of potable and non-potable water pipelines and disinfection of all potable water pipelines installed under this Contract.

B. Pipeline pressure and leakage testing is covered in the Pipeline Pressure and Leakage section.

1.2 GENERAL

A. Coordination

1. Contractor shall coordinate cleaning and disinfection work with adjacent work as necessary to preclude work interferences or duplication of effort and to expedite the overall progress of the work.

2. Contractor shall provide all necessary piping, piping connections, temporary valves, backflow preventers, flowmeters, sampling taps, pumps, disinfectant, neutralization agents, chlorine residual test apparatus, and all other items of equipment or facilities necessary to complete the cleaning and disinfection work.

3. Water for cleaning and disinfection work will be provided as stipulated in the Temporary Facilities section.

4. In all cases where it is necessary to interrupt service, permission of Owner shall be obtained at least two days before the service will be interrupted. In all cases where it is necessary to interrupt service to water customers, permission of the Owner shall be obtained and each customer affected shall be notified of the proposed service interruption and its possible duration in accordance with the Project Requirements section.

5. Unless otherwise specified, final cleaning and disinfection work shall not be performed until after hydrostatic testing of the pipelines and any resulting repair work completed.

6. Contractor shall notify *Owner's Representative* prior to the work to allow their representatives to be present during cleaning and/or disinfection of the pipelines.

B. Related Work

1. Other sections directly related to work covered in this section are the Pipeline Pressure and Leakage Testing section.

C. Governing Standard

1. All disinfection work shall conform to the requirements of ANSI/AWWA C651, and the requirements of Missouri Department of Natural Resources, except as modified herein. If any state or local requirements conflict with the provisions of this section, the state and local requirements shall govern.

2. Contractor shall notify federal, state, and local regulatory agencies to determine if any special procedures or permits are required for disposal of neutralized or diluted chlorinated water from the final flushing of pipelines and to identify acceptable locations for disposal of the flushing water. All requirements and costs associated with notification and obtaining any discharge permits shall be the responsibility of the Contractor.

D. Experience

1. The disinfection work shall be performed by a subcontractor specialized in such work, or with the permission of Engineer, Contractor may provide the necessary equipment and do the work with his own personnel. In either case, all work shall be done under the direct supervision of a competent and experienced specialist in such work.

2. Personnel performing the disinfection shall demonstrate a minimum of 5 years experience in the chlorination and dechlorination of similar pipelines.

1.3 SUBMITTALS

A. Cleaning and Disinfection Plan

1. Unless otherwise specified, Contractor shall submit a detailed cleaning and disinfection plan to Engineer 14 days prior to starting any cleaning and disinfection work. The plan shall cover the method and procedure proposed, necessary coordination, qualification of personnel performing the disinfection work, sequence of operations, the limits of the pipelines to be cleaned and disinfected, the positions of all valves, location of temporary bulkheads, materials and quantities of each to be used, equipment to be used, manner of filling and flushing the pipelines, chlorine injection points, sample points, bacteriological testing location and schedule, potable water source, method of metering the water if required, neutralization and disposal of wasted water, and all other methods and procedures to be followed in performing the cleaning and disinfection work.

B. Testing

1. Bacteriological testing shall be performed by an independent testing laboratory furnished by Contractor. Contractor shall submit the qualifications of the proposed independent testing laboratory for Owner approval prior to performing the specified bacteriological tests. Upon completion of each test, three copies of the test results shall be submitted to Engineer.

2. Contractor shall provide all items of equipment, piping, and other facilities necessary to assist with the collection of the samples as required. Locations for bacteriological sampling shall be in accordance with the governing standards or as acceptable to the Owner.

3. The chlorine residual tests shall be performed by Contractor. The test logbook shall be made available to Owner or Engineer upon request and shall be submitted to Engineer upon completion of all chlorine residual testing.

1.4 QUALITY ASSURANCE

A. Chlorine Residual Tests

1. Contractor shall provide the necessary apparatus for making the chlorine residual tests by the drop dilution method in Appendix A of ANSI/AWWA C651. Test results shall be recorded in a logbook that includes for each test: the location, date, time, test results, and test kit manufacturer.

B. Bacteriological Tests

1. Sampling and testing of water in the pipelines shall be performed after final flushing in accordance with Section 5 of ANSI/AWWA C651. Two consecutive sets of acceptable samples, taken at least 24 hours apart, shall be collected and standard heterotrophic plate counts measured for each sample.

C. Redisinfection

1. Should the bacteriological tests indicate the presence of coliform organisms at any sampling point, the pipelines shall be reflushed, resampled and retested in accordance with Section 5 of ANSI/AWWA C651. If check samples show the presence of coliform organisms, then the pipelines shall be rechlorinated until acceptable results are obtained.

PART 2 - PRODUCTS

2.1 MATERIALS

A. All materials furnished by Contractor shall conform to the requirements of ANSI/AWWA C651 and shall be clean and free of debris which could infer questionable test results.

B. Calcium Hypochlorite (Dry)

1. Calcium hypochlorite shall conform to AWWA B300.

C. Sodium Hypochlorite (Solution)

1. Sodium hypochlorite shall conform to AWWA B300.

D. Chlorine Residual Test Kit

1. Chlorine residual concentration shall be measured using an appropriate range, drop count titration kit or an orthotolidine indicator comparator with wide range color discs. The

color disc range shall be selected to match chlorine concentration limits. Test kits shall be maintained in good working order and available for immediate test of residuals at point of sampling. Test kits manufactured by Hach Chemical or Orbeco-Hellige are acceptable.

PART 3 - EXECUTION

3.1 GENERAL

A. Contractor shall coordinate with KC Water so a KC Water representative is on-site for all flushing and disinfecting activities.

3.2 APPLICATION

A. Cleaning

1. Pipelines, including all associated valves and fittings, shall be cleaned to the satisfaction of Owner and Engineer.

2. Small pipelines shall be cleaned by flushing with water at the maximum velocity which can be developed, but not less than 3.0 feet per second, unless otherwise permitted by Engineer. Flushing shall continue until the pipeline is free of dirt, debris, and other foreign materials. Cleaning shall precede disinfection.

3. Large pipelines may be flushed as specified for small pipelines, cleaned with a hose, or cleaned by other methods acceptable to Engineer. Flushing or other cleaning methods shall continue until the pipeline is free of dirt, debris, and other foreign materials. Cleaning shall precede disinfection.

4. Flushing shall be accomplished through the installed valves or fittings, blow-offs or through temporary flushing connections installed for that purpose.

5. Booster pumps shall be used if needed to obtain the necessary volume or velocity of water. Pumping equipment installed under this Contract shall not be used for flushing, nor shall the flushing water be passed through them or other installed equipment; temporary bypass piping at each pump or installed equipment shall be provided as needed.

B. Disinfection Procedure

1. The pipelines shall be disinfected by the continuous feed method. Potable water shall be used in conjunction with the chlorination agent.

2. For the continuous feed method, the chlorination agent shall be injected into the line at the supply end of each new pipeline or valved section thereof.

3. Admission of disinfectant solution into or the flushing thereof through existing piping shall be held to the minimum possible, and then only after adequate measures have been taken to prevent any such solution of chlorinated wastewater from entering branch service connections to water customers or other piping systems.

4. During disinfection, all valves and hydrants shall be operated to ensure that all appurtenances are disinfected. Valves shall be operated such that the chlorine solution in the pipeline being chlorinated will not flow back into the supply line. Check valves shall be used if needed.

5. Existing pipelines which may become contaminated during work requiring connections to the new pipeline, involving either tapping or cutting into operations, shall be flushed and disinfected in accordance with Section 4 of ANSI/AWWA C651.

C. Final Flushing

1. Upon completion of chlorination, but before sampling and bacteriological testing, all heavily chlorinated water shall be removed from the lines by flushing with potable water until the chlorine residual in the lines is not higher than that generally prevailing in the adjacent existing system or as acceptable to the Owner.

2. Final flushing shall be accomplished as specified for cleaning of pipelines.

D. Disposal of Chlorinated Wastewater

1. All chlorinated wastewater to be discharged shall be neutralized by chemical treatment and disposed in accordance with Section 4 of ANSI/AWWA C651, ANSI/AWWA C655 and the requirements of the governing agency specified herein. Schedule, rates of flow, and locations of discharge of disinfection and flushing water shall be coordinated with Engineer and in accordance with all applicable rules and regulations.

End of Section

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SECTION 02704 - PIPELINE PRESSURE AND LEAKAGE TESTING

PART 1 - GENERAL

1.1 SCOPE

A. This section covers field hydrostatic pressure and leakage testing of piping. The term "piping" shall be used in this section to refer to piping systems, pipelines, or sections thereof.

B. Testing of other piping is covered in the Miscellaneous Piping and Accessories Installation section. Cleaning and disinfection of piping is covered in the Cleaning and Disinfection of Water Pipelines section.

1.2 GENERAL

A. Contractor shall coordinate pressure and leakage testing with adjacent work as necessary to preclude work interferences or duplication of effort and to expedite the overall progress of the work.

B. Contractor shall provide all necessary piping, piping connections, temporary valves, backflow preventers, and all other items of equipment or facilities necessary to complete the pressure and leakage testing.

C. In all cases where it is necessary to interrupt service, permission of Owner shall be obtained at least two days before the service will be interrupted. In all cases where it is necessary to interrupt service to water customers, permission of the Owner shall be obtained and each customer affected shall be notified of the proposed service interruption and its possible duration in accordance with the Project Requirements section.

D. Contractor shall notify federal, state, and local regulatory agencies to determine if any special procedures or permits are required for disposal of water used for pressure and leakage testing and to identify acceptable locations for disposal of the water. All requirements and costs associated with notifications and obtaining any discharge permit or approvals shall be responsibility of Contractor.

E. Engineer or Engineer's representative shall be present during testing and shall be notified of the time and place of testing at least 3 days prior to commencement of testing. All testing shall be performed to the satisfaction of Engineer, and in accordance with all governing standards and regulations.

F. Testing Schedule and Procedure

1. A testing schedule and procedure shall be submitted to Engineer for review and acceptance not less than 21 days prior to commencement of testing. The schedule and

procedure shall include, but not be limited to the following information for each pipe section to be tested:

a. limits of each pipe test section;
b. proposed time and sequence;
c. physical locations and set positions of all valves;
d. locations of temporary bulkheads, stops, caps, restraints, supports, and other temporary equipment needed;
e. manner of filling and source of water;
f. method and location of metering volumes;
g. method and location of gauging pressures; and
h. method and location of disposal of test water.

G. Special Testing Requirements

1. Special testing requirements include the following:

2. Contractor shall be required to meet requirement of KC Water Standards.

3. Water for filling the pipeline from the Owner's existing facilities may not be available during the Owner's high water demand season from approximately June 1 to October 1.

4. Unless otherwise acceptable to Engineer, the general sequence of work for each pipeline, or valved or bulkheaded section thereof, shall be as follows:

a. Initial cleaning and flushing of pipeline.
b. Filling pipeline.
c. Hydrostatic pressure and leakage testing.
d. Disinfection.
e. Final flushing and neutralization of heavily chlorinated water.
f. Bacteriological tests.

5. Unless otherwise acceptable, during testing of the pipeline, all valves, except for auxiliary hydrant valve(s), shall be in the open position.

6. Unless otherwise acceptable, temporary bulkheads shall be provided during testing so that the test pressure is not applied to existing or new valves and hydrants, or to existing water lines, or to any portion of water lines installed under this Contract that have already been put into service.

7. Unless otherwise acceptable, a temporary pressure gauge shall be installed at each end of the limits of the pipeline to be tested.

8. Unless otherwise acceptable, tests shall be conducted before connections are made to existing water lines, or to any portion of water lines installed under this Contract that have already been put into service.

9. Unless otherwise acceptable, upon completion of testing and disinfection, connections made to existing water lines or to any portion of water lines installed under this Contract

that have already been put into service, and any other portion of the pipeline not subject to the pressure test, shall be visually inspected for leakage after placing the water line into service and before backfilling the connection.

H. Water

1. Following completion of testing, the water shall be disposed of in accordance with the requirements of regulatory agencies and in a manner acceptable to Engineer.

1.3 SUBMITTALS

A. Test Procedures and Plans

1. Test plans and procedures shall be submitted as outlined in the GENERAL section of this specification.

B. Test Results and Reports

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

A. All necessary connections between the piping to be tested and the water source, together with pumping equipment, water meter, pressure gauges, backflow prevention, and all other equipment, materials, and facilities required to perform the specified tests, shall be provided. All required blind flanges, valves, bulkheads, bracing, blocking, and other sectionalizing devices shall also be provided. All temporary sectionalizing devices shall be removed upon completion of testing. Vents shall be provided in test bulkheads where necessary to expel air from the piping to be tested.

B. Test pressure shall be applied by means of a force pump sized to produce and maintain the required pressure without interruption during the test.

C. Water meters and pressure gauges shall be accurately calibrated and shall be subject to review and acceptance by Engineer.

D. Permanent or temporary gauge connections shall be installed at each location where test gauges are connected to the piping during the required test. Drilling and tapping of pipe walls will not be permitted. Upon successful completion of testing, each permanent gauge connection shall be fitted with an isolation valve and a permanent gauge, and each temporary gauge connection, if used, shall be fitted with a permanent sealed plug or cap acceptable to the Engineer.

E. Permanent or temporary fill and vent connections shall be installed as needed for the required test. Drilling and tapping of pipe walls will be permitted. Upon successful completion of testing, each permanent fill and vent connection shall be fitted with the permanent fill or vent

piping, and each temporary fill and vent connection, if used, shall be fitted with a permanent sealed plug or cap acceptable to the Engineer.

PART 3 - EXECUTION

3.1 GENERAL

A. Contract shall coordinate with KC Water so a KC Water representative is on-site for all flushing and disinfecting activities.

3.2 FILLING AND VENTING

A. Before filling the piping with water, care shall be taken to ensure that all air release valves and other venting devices are properly installed and operating properly. Hand-operated vent valves shall not be closed until an uninterrupted stream of water is flowing from each valve. The rate of filling the piping with water must not exceed the venting capacity of the installed air vent valves and devices.

3.3 BLOCKING AND BACKFILLING

A. Piping shall be adequately blocked, anchored, and supported before the test pressure is applied. All piping may be tested after backfilling.

3.4 PRESSURE TESTING

A. After the piping to be tested has been filled with water, the test pressure shall be applied and maintained without interruption within plus or minus 5 psi of test pressure for 2 hours plus any additional time required for Engineer to examine all piping being tested and for Contractor to locate any defective joints and pipe materials. The test pressure shall be in accordance with the requirements specified for pipeline or plant piping.

B. Pipeline Test Pressure

1. Not used.

C. Piping Test Pressure

1. A minimum pressure of not less than the normal operating pressure (for the lowest point on the line) plus 50% for surge, but in no case less than 225 psi at the lowest point in the line.

3.5 PIPING LEAKAGE TESTING

A. All piping shall be watertight and free from leaks. Each leak which is discovered within the correction period stipulated in the General Conditions shall be repaired by and at the expense of Contractor. Leakage testing allowance shall conform to the latest edition of AWWA C600.

End of Section

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SECTION 02850 – EROSION AND SEDIMENT CONTROL

PART 1 - GENERAL

1.1 SCOPE

A. This section covers the requirements for controlling erosion of soil from the site as specified herein.

1.2 GENERAL

A. Contractor shall prevent erosion of soil on the site and adjacent property caused by his construction activities.

B. Effective measures shall be initiated prior to the commencement of clearing, grading, excavation, or other activity that will disturb the natural protection.

C. Erosion and sediment control shall comply with the provisions of the Missouri Department of Natural and all other agencies and authorities as applicable.

D. Work shall be scheduled to expose areas subject to erosion for the shortest possible time and natural vegetation shall be preserved to the greatest extent practicable.

E. Temporary storage and construction buildings shall be located, and construction traffic routed, to minimize erosion.

F. Temporary fast-growing vegetation or other ground cover, silt fencing, and other measures and devices shall be provided as necessary to control runoff and erosion.

G. Contractor is responsible for implementing and maintaining the erosion and sediment control requirements specified herein until the erosion and sediment control measures are no longer required. At the completion of the Work, all remaining temporary erosion and sediment control devices shall be removed.

H. Additional requirements for trench dewatering and temporary discharge of storm water and other water are covered in the Excavation and Fill for Structures section.

1.3 SUBMITTALS

A. Drawings and Data - General
   1. Drawings, specifications, and data covering the proposed materials shall be submitted in accordance with the Submittals Procedures section.

PART 2 - PRODUCTS

A. Erosion and Sediment Control Devices
   1. Erosion and sediment control devices to be utilized throughout the project may include, but are not limited to, the following:
      - Vegetative Buffer Strips
      - Silt/Sediment Fencing
      - Temporary Seeding
      - Mulching
      - Earth Diversion Dikes
      - Sediment Basins
      - Protection of Trees
      - Drainage Swales
      - Permanent Seeding
      - Channel/Slope Riprap
      - Area/Curb Inlet Sediment Filters
      - Rock Dam Ditch Checks
      - Straw Bale Ditch Checks
      - Straw Bale Erosion/Sediment Control
      - Sandbags
      - Tarp Covers

PART 3 - EXECUTION

3.1 SITE PREPARATION

A. The Contractor shall be responsible for constructing, operating, and maintaining soil erosion and sediment control measures for the construction areas and any on-site and off-site stockpile areas used by the Contractor. The Contractor also shall remove such measures and restore the sites of erosion and sediment control facilities upon completion of construction.

3.2 EROSION AND SEDIMENT CONTROL REQUIREMENTS

A. All disturbances and changes to the earth shall be made in such a manner as to minimize the duration and area of disturbed land exposed and unprotected against the erosive action of wind, ice, precipitation, and the flow of water.

B. Sediment generated by accelerated soil erosion shall be restricted to a nonpolluting minimum as determined by the Engineer.

C. All sediment control facilities shall be maintained in an operating condition satisfactory to the Engineer for the period of time that the Owner deems necessary. This provision applies to all facilities that receive drainage from the earth-change area, whether such facilities are a part of the proposed construction or existed prior to proposed construction.

D. Stabilization measures shall be repeated as often as necessary, as determined by the Engineer.

E. Any facility constructed for the conveyance of water around, through, or from the earth-change area shall limit the water flow to a non-erosive velocity.

F. Sediment control devices/measures and facilities shall be removed upon completion of the construction. The land surface formerly occupied by such facilities shall then be graded and restored.

3.3 EROSION AND SEDIMENT CONTROL MEASURES.

A. The Contractor shall provide additional devices and/or measures where field conditions warrant.

B. Construction Times: The Contractor shall minimize the duration of the disturbance to the area.
   1. Construction Sequence: The Contractor shall minimize the area of unstabilized land surface over which storm water must flow. Construction shall proceed from lower ground toward higher ground, whenever possible.
   2. Temporary Stockpiles: Steps shall be taken to minimize erosive loss and resultant off-site sedimentation from stored piles of excavated spoils, topsoil, sand, gravel, and aggregate. Control methods used by the Contractor may include remote storage, covering, temporary stabilization, compacting, diversion ditches, and silt fences, in total or in any combination, as may be dictated by the size, type, location, season and anticipated duration of storage.
   3. Sediment Control: The Contractor shall provide suitable sediment control devices/measures and facilities at affected connections to existing or new storm drains, to minimize deposition of sediment in the storm drains during the construction period. Sediment control devices/measures and facilities shall be provided in accordance with the requirements of all laws and regulations prior to any significant clearing, grading, or surface disruption of the tributary areas.
   4. Dewatering: Pumped water from well points, dewatering wells, or excavations shall not be discharged onto unstabilized areas. Such discharge shall be conveyed by pipe, hose or stabilized channel to a settling basin or other suitable sediment control facility.
   5. Vehicle Controls: Where frequent use of improved roads by off-the-road vehicles occurs, appropriate methods shall be used to minimize the transfer of sediment-producing materials from the treads and tracks of the vehicles onto the improved road surface.

3.4 TEMPORARY STORM WATER RUNOFF PROVISIONS

A. Contractor shall provide for the drainage of storm water runoff and any water that may be applied or discharged on the site in performance of the Work. Storm water facilities shall be adequate to prevent damage to the Work, the site, and adjacent property.

B. Existing drainage channels and conduits shall be cleaned, enlarged, or supplemented as necessary to convey all increased runoff attributable to Contractor's operations. Dikes shall be constructed as necessary to divert increased runoff from entering adjacent property (except in natural channels), to protect Owner's facilities and the Work, and to direct water to drainage channels or conduits. Ponding shall be provided as necessary to prevent downstream flooding.

C. All areas disturbed by construction shall be seeded as specified in the Seeding section.

D. Pumping for dewatering is subject to the Missouri Clean Water Law administered by the Missouri Department of Natural Resources.

3.5 NOTICE OF INTENT AND EROSION AND SEDIMENT CONTROL PLAN

A. Contractor shall complete a Storm Water Pollution Prevention Plan (SWPPP) and submit a Notice of Intent (NOI), including an erosion and sediment control plan, for a National Pollutant Discharge Elimination System (NPDES) Missouri State Operating Permit from the Missouri Department of Natural Resources (MoDNR). Contractor shall obtain, prior to the start of construction, authorization to discharge storm water runoff under the construction storm water general permit MO-RAxxxxx. Information regarding this authorization can be found on the MoDNR Construction Land Disturbance Permits website: https://dnr.mo.gov/water/business-industry-other-entities/permits-certification-engineering-fees/stormwater/construction-land-disturbance

B. Contractor shall pay the applicable fees for the Permit. A copy of the permit shall be submitted to the Engineer for record purposes.

C. As a part of the NOI submittal, the Contractor shall submit a plan for control of soil erosion and sediment to MoDNR and to the Engineer for review and acceptance prior to starting construction work. The plan shall show locations and limits of disturbed areas, methods of control details, description of the phasing, sequencing, and time of the work. The plan also shall indicate the inspection, enforcement, and maintenance program to be followed by the Contractor. The plan shall be prepared by a certified erosion and sediment control professional or a professional engineer or landscape architect registered in Missouri.

D. The Contractor shall be responsible for the proper implementation (construction, timing and sequencing of operations, and operation and maintenance) of the Erosion and Sediment Control Plan. The Contractor shall obtain all necessary erosion and sediment control and land disturbance permits. A regular inspection program and a thorough maintenance program shall be developed and implemented by the Contractor, to insure the effectiveness of the erosion and sediment control practices.

3.6 EROSION CONTROL MAINTENANCE

A. During constriction, the Contractor and Resident Project shall make weekly inspections to assure that the erosion control devices identified are in place and functioning properly. In the event that the devices require repair or maintenance, it shall be the responsibility of the Contractor to make repairs within 2 working days following the inspections.

B. In the event the Contractor fails to properly install and main the erosion control devices, the Owner may obtain the services of others. The Owner may back-charge the Contractor for all expenses associated with erosion control, including the additional cost of services of another Contractor, additional engineering services, and additional resident inspection services. These additional costs may exceed the Contractor’s

original estimate of costs for the work; however, the Contractor shall be responsible for full reimbursement of said costs to the Owner.

3.7 REMOVAL OF EROSION CONTROL MEASURES

A. Erosion control devices shall remain in place until the construction site has been reestablished with permanent seeding or sodding. The Contractor's obligation for continued maintenance of erosion control devices shall not terminate until he is notified by Owner that the control measures are no longer required. It shall be the responsibility of the Contractor to remove all remaining erosion control devised when so notified.

3.8 SPECIAL REQUIREMENTS – CITY AND COUTNY

A. Contractor shall obtain a Land Disturbance Permit if required by the City or County. Contractor shall comply with the City or County erosion and sediment control ordinances, standards, and Best Management Practices (BMP). Contractor shall pay all fees associated with the permits.

End of Section

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SECTION 02930 - SEEDING

PART 1 - GENERAL

1.1 SCOPE

A. This section covers the operations necessary to produce established grass covered areas for restoring and stabilizing the soils disturbed by construction operations, including areas of cut and fill, trenching, temporary roads, and temporary staging or storage areas.

B. This section covers seeding to be performed after backfilling and final grading are complete. All areas disturbed by construction operations shall be treated as specified herein.

1.2 GENERAL

A. Governing Standard

B. All seeding work shall be in accordance with the Owner's Water Services Department Standard Specifications except as modified herein.

C. Completion

1. Seeding Work shall be completed during the period of February 1 and April 15 for spring planting and August 15 and October 15 for fall planting. . At Owner's option, a portion of the final payment not to exceed one (1) percent of the contract price may be retained until an acceptable stand for all grass/ground cover is established. Seeding requirements are as follows:

    a. Repair any existing areas damaged during construction.

1.3 SUBMITTALS

A. Invoices and Analysis Labels

1. A copy of supplier's invoices for all seed, mulch, and fertilizer which shows the quantity by weight purchased for the project and representative labels bearing the manufacturer's or vendor's guaranteed statement of analysis shall be submitted to Engineer for review and approval to assure compliance with specified requirements for quality and application rates.

1.4 GUARANTEE

A. Seeding

1. Contractor shall guarantee a uniform stand of seeding, free of weeds to the extent practical, and acceptable to Owner.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Shipping shall be in accordance with the Product Delivery Requirements section. Handling and storage shall be in accordance with the Product Storage and Handling Requirements section.

B. Prior to use, all products shall be kept dry and in a weatherproof location so that their effectiveness will not be impaired.

PART 2 - PRODUCTS

2.1 MATERIALS

A. All materials shall conform to the requirements of the Governing Standard, except where otherwise specified.

B. Starter Fertilizer and Seeding

1. Standard fertilizer and seeding mixtures shall be as specified within the Owner's Water Services Department Standard Specifications.

C. Topsoil

1. Topsoil shall be fertile, natural soil, typical of the locality, free from stones, roots, sticks, clay, peat, weeds, and sod, and obtained from naturally well drained areas. It shall not be excessively acidic or alkaline nor contain toxic material harmful to plant growth. Stockpiled topsoil may be used but the Contractor shall furnish additional topsoil at his own expense if required.

D. Mulch

1. Mulch shall be a specially processed cellulose fiber containing no growth or germination inhibiting factors or shall consist of straw from hay and shall include a tackifier. Mulch for hydroseeding operation shall be a wood mulch or combination wood and paper mulch in accordance with the Governing Standard.

PART 3 - EXECUTION

3.1 GENERAL

A. Execution of seeding work shall conform to the Governing Standard, or shall be as specified herein, whichever is the most stringent.

B. Clearing

1. Prior to finish grading, areas to be seeded shall be cleared to remove stumps, stones larger than 3 inches , roots, cable, wire, debris or other materials that might hinder seeding and/or sodding and future turf maintenance.

C. Finish Grading

1. Seeding shall not be started until all earthwork has been substantially completed. Backfills and fills shall be allowed to settle, the topsoil spread, and finish grading completed before the Work is started. Finish grading shall result in a surface conforming to the contours indicated on the Drawings.

D. Application of Fertilizer

1. After finish grading, any fertilizer specified shall be applied uniformly to areas to be seeded.

E. Final Preparation

1. Following application of additives and/or fertilizers the areas to be seeded and/or sodded shall be tilled to a true depth of 6 inches by disking, harrowing, or other accepted methods to thoroughly incorporate the additives and fertilizer, destroy vegetation, and pulverize the soil. After tilling, the bed shall be smoothed by dragging or floating. The surface shall be cleared of all stones, stumps or other objects larger than 1-1/2 inches in thickness or diameter; roots, wire, grade stakes, and other objects that might hinder future turf maintenance operations.

2. When results are not satisfactory because of drought, excessive moisture or other causes, the Work shall be stopped until such conditions have improved or have been corrected.

3. When possible, operations shall be performed parallel to the contour lines and operations uphill and downhill shall be avoided.

3.2 SEEDING

A. Seed Application

1. Seed shall be applied within 72 hours after preparation of the seedbed. Seed shall be applied with equipment designed to give uniform application. Any method or

combination of methods which uniformly distributes the seed directly in contact with the soil, covers the seed, and firms the bed, may be selected.

B. Mulching

1. All seeded areas shall be mulched within 24 hours following seed application.

3.3 REPLANTING

A. Seeded Areas

1. Unacceptably seeded areas shall be overseeded or completely reseeded as instructed by Engineer. Unless otherwise permitted by Engineer, reseeding shall be performed during the next planting season.

3.4 MAINTENANCE

A. All areas shall be maintained until final acceptance of the project.

B. Seeded Areas

1. Maintenance shall include any necessary reseeding, repair of erosion damage, and replacement of displaced mulch until covered with seedlings. In the event erosion occurs from either watering operations or rainfall, such damage shall be repaired.

End of Section

SECTION 03600 – GROUTING

PART 1 - GENERAL

1.1 SCOPE

A. This section covers procurement and installation of grout. Unless otherwise specified, only nonshrink grout shall be furnished.

B. Epoxy grouting and adhesive anchoring of anchor bolts, threaded rod anchors, and reinforcing bars is covered in the Anchorage in Concrete section.

1.2 SUBMITTALS

A. All submittals shall be made in accordance with the Submittal Procedures section.

B. A letter of certification indicating the type of grout to be supplied and the intended use of each type shall be submitted in accordance with the Submittals Procedures section.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Materials shall be handled, transported, and delivered in a manner which will prevent damage of any kind. Materials shall be protected from moisture.

PART 2 - PRODUCTS

2.1 MATERIALS

Nonshrink Grout	Precision cementitious grout with demonstrated non-shrinking properties, minimum 28 day compressive strength of 8000 psi; L&M "Crystex," Master Builders Solutions "Masterflow 928," Sika "SikaGrout 328," Euclid "Hi-Flow Grout," Dayton Superior "Sure-Grip High Performance Grout," or SpecChem "SC Precision Grout." Grout selected shall be consistent with intended use as stated in manfacturer's product data sheets.
Water	Clean and free from deleterious substances.

2.2 CEMENTITIOUS GROUT

A. Cementitious grout shall be furnished factory premixed so that only water is added at the jobsite.

2.3 EPOXY GROUT

A. Epoxy grout shall be used in lieu of cementitious grout when required by the equipment manufacturer for performance or warranty requirements. Epoxy grout products and installation procedures shall be submitted to Engineer for approval.

PART 3 - EXECUTION

3.1 CEMENTITIOUS GROUT INSTALLATION.

A. Preparation

1. The concrete foundation to receive cementitious grout shall be saturated with water for at least 12 hours preceding grouting unless additional time is required by the grout manufacturer.

B. Mixing

1. Grout shall be mixed in a mechanical mixer. No more water shall be used than is necessary to produce a flowable grout, nor shall water content exceed the amount recommended by the manufacturer.

C. Temperature Restrictions

1. Grout shall be placed in accordance with the manufacturer's published temperature restrictions. Ambient temperature and grout temperature shall be a minimum of 40 degrees F and rising at time of placement. Grout shall not be placed on frost covered surfaces. Grout shall be protected from freezing until it has reached a minimum strength of 4,000 psi. Grout shall not be placed when the ambient or grout temperature exceeds 90 degrees F.

D. Placement

1. Unless otherwise specified or indicated on the Drawings, grout under baseplates shall be 1-1/2 inches thick. Grout shall be placed in strict accordance with the directions of the manufacturer so that all spaces and cavities below the baseplates are completely filled without voids. Forms shall be provided where structural components of baseplates will not confine the grout.

E. Edge Finishing

1. In all locations where the edge of the grout will be exposed to view, the grout shall be finished smooth after it has reached its initial set. Except where shown to be finished on a slope, the edges of grout shall be cut off flush at the baseplate.

F. Curing

1. Grout shall be protected against rapid loss of moisture by covering with wet cloths or polyethylene sheets. After edge finishing is completed, the grout shall be wet cured for at least 3 days and then an acceptable membrane curing compound shall be applied.

3.2 EPOXY GROUT INSTALLATION

A. Epoxy grout shall be installed in accordance with ACI 351.5.

End of Section

DIVISION 5 – METALS

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DIVISION 9 – FINISHES

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SECTION 09940 - PROTECTIVE COATINGS

PART 1 - GENERAL

1.1 SCOPE

A. This section covers field applied protective coatings, including surface preparation, protection of surfaces, inspection, and other appurtenant work for equipment and surfaces designated to be coated with heavy-duty maintenance coatings. Regardless of the number of coats previously applied, at least two field coats in addition to any shop coats or field prime coats shall be applied to all surfaces unless otherwise specified.

1.2 GENERAL

A. Cleaning, surface preparation, coating application, and thickness shall be as specified herein and shall meet or exceed the coating manufacturer's recommendations. When the manufacturer's minimum recommendations exceed the specified requirements, Contractor shall comply with the manufacturer's minimum recommendations. When equivalent products are acceptable to Engineer, Contractor shall comply with this Specification and the coating manufacturer's recommendations.

B. Governing Standards

1. All cleaning, surface preparation, coating application, thickness, testing, and coating materials (where available) shall be in accordance with the referenced standards of the following AWWA, ANSI, NACE, SSPC, NSF, and ASTM.

C. Delivery and Storage

1. All coating products shall be received and stored in accordance with the coating manufacturer's recommendations.

1.3 SUBMITTALS

A. General Submittals and Data

1. Contractor shall submit color cards for all coatings proposed for use, together with complete descriptive specifications, manufacturer's product data sheet and the completed Coating System Data Sheets, to Engineer for review and color selection. Each product data sheet shall include application temperature limits including recoat time requirements for the ambient conditions at the site, including temperatures up to 130° F . Requests for review submitted directly to Engineer by coating suppliers will not be considered.

B. NSF 61 Compliance

1. When the proposed products will be in contact with treated or raw water in potable water treatment facilities, Contractor shall submit certifications that the proposed systems are in compliance with ANSI/NSF 61.

C. Data Sheets

1. Contractor shall submit a Coating System Data Sheet for each separately identified surface in the Metal Surfaces Coating Schedule, Concrete and Masonry Surfaces Coating Schedule, and the Miscellaneous Surfaces Coating Schedule that will be used in the Project, using the appropriate Coating System Data Sheet forms (Figures 1-09940and 2-09940) at the end of this section. Each field coating system shall be acceptable to the coating material manufacturer.

a. Coating System Data Sheets shall be assigned a unique number with a prefix letter based on the following:

Prefix	Surfaces	Fig. 09940
A	Iron and steel (coated entirely in field)	1
A	Iron and steel (shop primed)	2
C	Concrete and concrete block	1
E	Equipment - submerged	1
E	Equipment – nonsubmerged	2
F	Nonferrous metal	1
G	Galvanized	1

b. Each coating system that will be applied entirely in the field shall be assigned only a prefix letter and no suffix letter. Fig 1-09940 shall be submitted for each surface coated entirely in the field.

c. Each shop-applied coating system that includes one or more field applied coats shall be assigned both a prefix letter and suffix letter "F." Fig 2-09940 shall be submitted for each surface having a shop applied coating and one or more field applied finish coats.

d. A separate Coating System Data Sheet shall be developed and submitted for each surface scheduled to be coated or variation or change in a coating system. The number identifying the surface and coating system shall be of the form $A1_1$ or $A1_2$-F. The subscript number shall be assigned by the Contractor so that each surface and coating system combination is uniquely identified. For example:
   1) $A1_1$-F may be assigned to "Epoxy – one coat to metal curbs for skylights and power roof ventilators that have been shop primed."
   2) $A2_1$ may be assigned to "Epoxy – two coats to non-galvanized structural and miscellaneous steel exposed to view inside buildings."

3) $C2_1$ may be assigned to "Epoxy – two coats to all concrete and concrete block in corrosive area (Except floors and surfaces scheduled to receive other coatings) which are exposed to view."
4) $C2_2$ may be assigned to "Epoxy – two coats to walls, floors, and curbed areas, adjacent to corrosive chemical storage and feed equipment as indicated on the Drawings."

D. Color Submittals

1. The manufacturer's standard colors will be acceptable for all coatings.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Alternative Manufacturers

1. In addition to the coatings listed herein, equivalent products of other manufacturers that distribute globally will also be acceptable.

B. Equivalent Coatings

1. Whenever a coating is specified by the name of a proprietary product or of a particular manufacturer or vendor, it shall be understood as establishing the desired type and quality of coating. Other manufacturers' coatings will be accepted, provided that sufficient information is submitted to enable Engineer to determine that the proposed coatings are equivalent to those named. Information on proposed coatings shall be submitted for review in accordance with the Submittals Procedures section. Requests for review of equivalency will be accepted only from Contractor and will be considered only after the contract has been awarded.

2.2 MATERIALS

A. All coatings shall be delivered to the job in original, unopened containers, with labels intact. Coatings shall be stored indoors and shall be protected against freezing. No adulterant, unauthorized thinner, or other material not included in the coating formulation shall be added to the coating for any purpose.

B. All coatings shall conform to the air quality regulations applicable at the location of use. Coating materials that cannot be guaranteed by the manufacturer to conform, whether or not specified by product designation, shall not be used.

C. With the exception of heat resistant coatings, the coatings specified have been selected on the basis of the manufacturer's statement that the VOC content of the product is 2.8 lbs per gallon or less; however, it shall be the Contractor's responsibility to use only coating materials that are in compliance with the requirements of all regulatory agencies. Local regulations may require

some coatings to have a lower VOC content than specified herein. The coatings specified may meet the VOC limits in the unthinned (as shipped) condition but may exceed the limits if thinned according to the manufacturer's recommendations. In such case, the coatings shall not be thinned beyond the 2.8 lbs per gallon limit, and if the product cannot be thinned to suit the application method or temperature limits, another manufacturer's coating shall be used, subject to acceptance by Engineer's coating shall be used, subject to acceptance by Engineer.

D. Contractor shall be responsible for ensuring the compatibility of field coatings with each other or with any previously applied coatings. Coatings used in successive field coats shall be produced by the same manufacturer. The first field coat over shop coated or previously coated surfaces shall cause no wrinkling, lifting, or other damage to underlying coats.

E. All coatings used on surfaces that will be in contact with potable or treated water shall be certified as being in compliance with ANSI/NSF 61. Coatings that cannot be so certified, whether or not specified by manufacturer and by product designation, shall not be used.

F. Primers

Universal Primer (tie coat)	PPG "Amerlock Sealer," Carboline "Rustbond Series," International Devoe "Devran 201H," Tnemec "Series 27 F.C. Typoxy," or Sherwin-Williams "Dura Plate 235."

G. Intermediate and Finish Coatings

Epoxy (NSF certified systems)	
Ferrous Metal Surfaces and Concrete Surfaces in Contact with Treated or Raw Water in Potable Water Facilities	PPG "Amerlock 400 High-Solids Epoxy Coating," Carboline "Carboguard 891 VOC," International Devoe "Bar-Rust 233H" Tnemec "Series N140 Pota-Pox Plus," or Sherwin-Williams "Dura Plate 235 NSF"; immersion service.
Aliphatic Polyurethane	PPG "Pitthane Ultra," Carboline "Carbothane 134HG," International "Intervane 990V" Tnemec "Series 1074 Endura-Shield II," or Sherwin-Williams "Acrolon 218HS."
Coal Tar Epoxy/ High-build coal tar epoxy	PPG Amercoat "78HB Coal Tar Epoxy," Carboline "Bitumastic 300 M," Tnemec "46H-413 Hi-Build Tneme-Tar," International "Interzone 954 Black" or Sherwin-Williams "Targuard Coal Tar Epoxy"

PART 3 - EXECUTION

3.1 SURFACE PREPARATION

A. All surfaces to be coated shall be clean and dry and shall meet the recommendations of the coating manufacturer for surface preparation. Freshly coated surfaces shall be protected from

dust and other contaminants. Oil and grease shall be completely removed by use of solvents or detergents before mechanical cleaning is started. The gloss on previously coated surfaces shall be dulled if necessary for proper adhesion of topcoats.

B. Surfaces shall be free of cracks, pits, projections, or other imperfections that would interfere with the formation of a smooth, unbroken coating film, except for concrete block construction where a rough surface is an inherent characteristic.

C. When applying touchup coating or repairing previously coated surfaces, the surfaces to be coated shall be cleaned as recommended by the coating manufacturer, and the edges of the repaired area shall be feathered by sanding or wire brushing to produce a smooth transition that will not be noticeable after the coating is applied. All coatings made brittle or otherwise damaged by heat of welding shall be completely removed.

D. Galvanized Surfaces

1. When a coating is required, galvanized surfaces shall be prepared for coating according to the instructions of the manufacturer of the epoxy. Any chemical treatment of galvanized surfaces shall be followed by thorough rinsing with clean water.

E. Ferrous Metal Surfaces

1. Ungalvanized ferrous metal surfaces shall be prepared for coating by using one or more of the following cleaning procedures specified here-in: solvents (SSPCSP1); abrasive blasting (SSPC-SP5, -SP10, -SP6, or -SP7) power tools (SSPCSP3 or -SP11); or hand tools (SSPCSP2). Oil and grease shall be completely removed in accordance with SSPCSP1 before beginning any other cleaning method. Surfaces of welds shall be scraped and ground as necessary to remove all slag and weld spatter. Tools which produce excessive roughness shall not be used.

2. All components of equipment that can be properly prepared and coated after installation shall be installed prior to surface preparation. Components that will be inaccessible after installation shall have the surfaces prepared and coated before installation. Motors, drive trains, and bearings shall be protected during surface preparation in accordance with the equipment manufacturer’s recommendations.

3. All cut or sheared edges shall be ground smooth to a 1/8 inch minimum radius for all material 1/4 inch thickness and larger. For material thickness less than 1/4 inch all cut or sheared edges shall be ground smooth to a radius equal to 1/2 the material thickness. Grinding of rolled edges on standard shapes with a minimum radius of the 1/16 inch will not be required.

4. All ferrous metal surfaces shall have all welds ground smooth and free of all defects in accordance with NACE Standard SP0178, Appendix C, Designation C and sharp edges ground smooth, if not previously prepared in the shop. Instead of blending of the weld with the base metal as required by the NACE standard, it will be acceptable to furnish a welded joint that has a smooth transition of the weld to the base metal. All welds shall be ground smooth to ensure satisfactory adhesion of paint.

5. The cleaning methods and surface profiles specified herein are minimums, and if the requirements printed in the coating manufacturer's data sheets exceed the limits specified, the value printed on the data sheets shall become the minimum requirement.

6. Ferrous Metal Surfaces – Non-immersion Service

   a. Ferrous metal surfaces, including fabricated equipment, in non-immersion service shall be cleaned to the degree recommended by the coating manufacturer for surfaces to be coated with coal tar epoxy, epoxy, and heat-resistant coatings, except galvanized surfaces. Surface preparation of ferrous metal surfaces in non-immersion service shall consist of abrasive blast cleaning to SSPC-SP6, and the first application of coating shall be performed on the same day. If more surface area is prepared than can be coated in one day, the uncoated area shall be blast cleaned again to the satisfaction of Engineer. Surface profile shall be as recommended by coating manufacturer, but not less than 2.0 mils .

7. Ferrous Metal Surfaces - Immersion Service

   a. Surface preparation of ferrous metal surfaces in immersion service shall consist of abrasive blast cleaning to at least SSPC-SP10 and the first application of coating shall be performed on the same day. If more surface area is prepared than can be coated in one day, the uncoated area shall be blast cleaned again to the satisfaction of Engineer. Surface profile shall be as recommended by coating manufacturer, but not less than 3.5 mils .

F. Concrete Surfaces

1. Not used.

G. Concrete Block Surfaces

1. Not used.

H. Plastic Surfaces

1. All wax and oil shall be removed from plastic surfaces that are to be coated, including PVC and FRP, by wiping with a solvent compatible with the specified coating.

I. Hardware

1. Hardware items such as bolts, screws, washers, springs, and grease fittings need not be cleaned prior to coating if there is no evidence of dirt, corrosion, or foreign material.

J. Aluminum

1. When a coating system is required, remove all oil or deleterious substance with neutral detergent or emulsion cleaner or blast lightly with fine abrasive.

K. Stainless Steel

1. When a coating system is required, surface preparation shall conform to the coating manufacturer's recommendations.

3.2 MIXING AND THINNING

A. Coating shall be thoroughly mixed each time any is withdrawn from the container. Coating containers shall be kept tightly closed except while coating is being withdrawn.

B. Coating shall be factory mixed to proper consistency and viscosity for hot weather application without thinning. Thinning will be permitted only as necessary to obtain recommended coverage at lower application temperatures. In no case shall the wet film thickness of applied coating be reduced, by addition of coating thinner or otherwise, below the thickness recommended by the coating manufacturer. Thinning shall be done in compliance with all applicable air quality regulations.

3.3 APPLICATION

A. Coating shall be applied in a neat manner that will produce an even film of uniform and proper thickness, with finished surfaces free of runs, sags, ridges, laps, and brush marks. Each coat shall be thoroughly dry and hard before the next coat is applied. Each coat shall be a different color, if available. In no case shall coating be applied at a rate of coverage greater than the maximum rate recommended by the coating manufacturer.

B. Coating failures will not be accepted and shall be entirely removed down to the substrate and the surface recoated. Failures include but are not limited to sags, checking, cracking, teardrops, fat edges, fisheyes, or delamination.

C. Priming

1. Edges, corners, crevices, welds, and bolts shall be given a brush coat (stripe coat) of primer before application of the primer coat. The stripe coat shall be applied by a brush and worked in both directions. Special attention shall be given to filling all crevices with coating. When using zinc primers the stripe coat shall follow the initial prime coat.

2. Abraded and otherwise damaged portions of shop-applied coating shall be cleaned and recoated as recommended by the manufacturer of the finish coating. Welded seams and other uncoated surfaces, heads and nuts of field-installed bolts, and surfaces where coating has been damaged by heat shall be given a brush coat of the specified primer. Before the specified spot or touchup coating of metal surfaces, edges, corners, crevices, welds, and bolts in the area of the spot or touchup coating shall be given a brush coat of primer. This patch, spot, or touchup coating shall be completed, and the paint film shall be dry and hard, before additional coating is applied.

D. Epoxy

1. When used, epoxy shall be applied in accordance with the coating manufacturer's recommendations, including temperature limitations and protection from sunlight until top-coated.

2. When concrete is to be coated, coatings shall not be applied to concrete surfaces in direct sunlight or when the temperature of the concrete is rising. Preferably the coating shall be applied when the temperature of the concrete is dropping.

3. When applying high build epoxy coatings with a roller or brush and where a dry film thickness of at least 4-6 mils per coat is required, two or more coats shall be applied to achieve the recommended dry film thickness equal to a spray applied coating.

E. Coal Tar Epoxy

1. When used, the application of coal tar epoxy, including time limits for recoating, shall conform to the recommendations of the coating manufacturer.

2. When concrete is to be coated, coatings shall not be applied to concrete surfaces in direct sunlight or when the temperature of the concrete is rising. Preferably the coating shall be applied when the temperature of the concrete is dropping.

F. Vinyl Ester

1. Not used.

G. Film Thickness

1. The total coating film thickness including intermediate coats and finish coat, shall be not less than the following:

Type of Coating	Minimum Dry Film Thickness
Medium consistency coal tar	20 mils .
Coal tar epoxy (two coats)	20 mils .
Epoxy	
Floors (two coats)	10 mils .
Surfaces with first coat of epoxy and final coat of aliphatic polyurethane	7 mils (5 mils DFT for epoxy plus 2 mils DFT for aliphatic polyurethane).
Surfaces with first and second coat of epoxy and final coat of aliphatic polyurethane	12 mils (10 mils DFT for epoxy plus 2 mils DFT for aliphatic polyurethane).
Other surfaces (two coats)	10 mils .
Immersion service (three coats)	15 mils .
Zinc, epoxy, polyurethane	

Type of Coating	Minimum Dry Film Thickness
Surfaces with first coat of zinc, intermediate coat of epoxy, and final coat of aliphatic polyurethane	10 mils , 3 mils zinc, 5 mils epoxy, plus 2 mils for aliphatic polyurethane.
Other (one coat)	5 mils .
Other (two coats)	10 mils .

H. Weather Conditions

1. Coatings shall not be applied, except under shelter, during wet, damp, or foggy weather, or when windblown dust, dirt, debris, or insects will collect on freshly applied coating.

2. Coatings shall not be applied at temperatures lower than the minimum temperature recommended by the coating manufacturer, or to metal surfaces such as tanks or pipe containing cold water, regardless of the air temperature, when metal conditions are likely to cause condensation. When necessary for proper application, a temporary enclosure shall be erected and kept heated until the coating has fully cured.

3. Coatings shall not be applied at temperatures higher than the maximum temperature recommended by the coating manufacturer. Where coatings are applied during periods of elevated ambient temperatures, Contractor and the coatings manufacturer shall be jointly responsible to ensure that proper application is performed including adherence to all re-coat window requirements. Precautions shall be taken to reduce the temperature of the surface application, especially for metal, at elevated temperatures above 100° F including shading application area from direct sunlight, applying coating in the evening or at night, and ventilating the area to reduce the humidity and temperature,

3.4 REPAIRING FACTORY FINISHED SURFACES

A. Factory finished surfaces damaged prior to acceptance by Owner shall be spot primed and recoated with materials equivalent to the original coatings. If, in the opinion of Engineer, spot repair of the damaged area is not satisfactory, the entire surface or item shall be recoated.

3.5 PROTECTION OF SURFACES

A. Throughout the work Contractor shall use drop cloths, masking tape, and other suitable measures to protect adjacent surfaces. Contractor shall be responsible for correcting and repairing any damage resulting from its or its subcontractors' operations. Coatings spilled or spattered on adjacent surfaces which are not being coated at the time shall be immediately removed. Exposed concrete or masonry not specified to be coated which is damaged by coatings shall be either removed and rebuilt or, where authorized by Owner, coated with two coats of masonry coating.

3.6 FIELD QUALITY CONTROL

A. The following inspection and testing shall be performed: surface profile, visual inspection, and wet and dry film thickness testing. All inspection and testing shall be witnessed by Engineer.

B. Surface Profile Testing

1. The surface profile for ferrous metal surfaces shall be measured for compliance with the specified minimum profile. The surface profile for concrete shall comply with SSPC 13/NACE 6 Table 1 for severe service.

C. Visual Inspection

1. The surface of the protective coatings shall be visually inspected.

D. Film Thickness

1. Coating film thickness shall be verified by measuring the film thickness of each coat as it is applied and the dry film thickness of the entire system. Wet film thickness shall be measured with a gauge that will measure the wet film thickness within an accuracy of ±0.5 mil . Dry film thickness shall be measured in accordance with SSPC-PA 2.

E. Spark Testing

1. Not required.

F. Adhesion Testing

1. Not required.

3.7 FIELD PRIMING SCHEDULE

A. In general, steel and cast iron surfaces of equipment are specified to be shop primed. Any such surfaces which have not been shop primed shall be field primed. Damaged or failed shop coatings which have been determined unsuitable by Engineer shall be removed and the surfaces shall be field coated, including prime coat (if any). Galvanized, aluminum, stainless steel, and insulated surfaces shall be field primed. Primers used for field priming, unless otherwise required for repair of shop primers, shall be:

Surface To Be Primed	Material
Equipment, surfaces to be coated with	
Aliphatic polyurethane	Universal primer.
Epoxy	Same as finish coats.
Coal tar coating	Same as finish coats.
Steel and cast iron, surfaces to be coated with	
Epoxy	Same as finish coats or inorganic zinc.

Surface To Be Primed	Material
Coal tar coating	Same as finish coats.
Aluminum	Epoxy.
Stainless steel	Epoxy.
Plastic surfaces, including PVC and FRP	Same as finish coats.
Insulated steel or cast iron piping	Universal primer.
Piping Insulation	As Recommended by manufacturer of finish coats.
Concrete, surfaces to be coated with epoxy	
For damp-proofing	Epoxy.
For all other surfaces	Epoxy concrete filler and surfacer.
Concrete block exposed in exterior locations	Epoxy concrete block filler.
Concrete block to be coated with epoxy	Epoxy concrete block filler.

3.8 FINISH COATING SYSTEMS

A. The following schedule lists coatings systems and coating surface designations. See Article 1-3 for a definition of the surface designations.

No.	Finish Coating Systems	Coating Surface Designation						
		A	C	E	F	G	H	P
1.	Epoxy – One coat	x			x	x		
2.	Epoxy – Two coats	x	x	x	x	x		x
3.	Epoxy / NSF – Two coats		x	x				
4.	Epoxy – Three coats	x	x	x				
5.	Epoxy / NSF – Three coats	x	x	x				
6.	Epoxy – First coat Aliphatic polyurethane – Finish coat	x	x	x	x	x		x
7.	Epoxy – First and second coat Aliphatic polyurethane – Finish coat	x	x	x	x	x		
8.	Universal primer – First coat Aliphatic polyurethane – Finish coat	x		x				
9.	Medium consistency coal tar – Two coats	x	x	x				
10.	Coal tar epoxy – Two coats	x	x	x				

B. Surfaces Not To Be Coated

1. Unless otherwise specified, the following surfaces shall be left uncoated:

a. Exposed aluminum, except ductwork.

b. Polished or finished stainless steel. Unfinished stainless steel, except flashings and counter flashings, shall be coated.
c. Nickel or chromium.
d. Galvanized surfaces, except piping, conduit, ductwork, and other items specifically noted.
e. Exterior concrete.
f. Surfaces specified to be factory finished.

C. Shop Finishing

1. Items to be shop finished including the following. Shop finishing shall be in accordance with the coating manufacturer's recommendations.

a. Surfaces where blast cleaning cannot be or is not recommended to be performed in the field.
b. Other items as otherwise specified.

D. Field Coating

1. Items to be field coated include the following. Field coating shall be in accordance with the field priming schedule, the coating schedule, and the manufacturer's recommendations.

a. Surfaces not indicated to be shop finished and surfaces where blast cleaning can be performed in the field.
b. All interior ferrous metal surfaces.
c. Other items as otherwise specified.

3.9 METAL SURFACES COATING SCHEDULE

Surfaces to be coated shall include new work, including Owner furnished equipment and surfaces disturbed by the Work. Surfaces that are not disturbed will not require recoating unless noted otherwise on the Drawings.

Surface To Be Coated	Finish Coating System
Non-galvanized and galvanized structural and miscellaneous steel exposed to view or to the elements in exterior locations.	A6
Non-galvanized and galvanized structural and miscellaneous steel exposed to view inside buildings.	A2
Steel handrails, steel floor plates, door frames.	A8
Unless otherwise specified, pumps, motors, speed reducers, and other machines and equipment exposed to view.	E8
Cast Iron and steel piping in immersion service including inside buildings, including valves, fittings, flanges, bolts, pipe support, hangers, and accessories and galvanized surfaces after proper priming.	A5

Surface To Be Coated	Finish Coating System
Pipe supports, hangers, bolts, and accessories in immersion service including inside buildings and galvanized surfaces after proper priming	**A5**
Copper pipe and tubing, including fittings and valves.	F1F2
All metal surfaces, unless otherwise specified, which will be submerged or buried, all or in part, including valves, and scum baffles, and cast iron slide gates, but excluding piping laid in the ground.	E4 **or** E5
Miscellaneous castings, including manhole rings and covers, and manhole steps. (One coat, if not shop coated.)	E2
Cast iron and steel piping in manholes, wetwells, grit basin, aeration basin, and similar locations, including valves fittings, flanges, bolts, supports, and accessories.	A4
All metal harness anchorage for buried piping.	A10
Aluminum in contact with concrete.	F1

3.10 CONCRETE AND MASONRY SURFACES COATING SCHEDULE

A. Not used.

3.11 MISCELLANEOUS SURFACES COATING SCHEDULE.

A. Not used.

3.12 PIPING IDENTIFICATION SCHEDULE

A. Not used.

End of Section

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SURFACE DESCRIPTION	**SYSTEM NO.**

SURFACE PREPARATION DESCRIPTION		
☐ Solvent SSPC-SP1 ☐ Ferrous Metal Nonimmersion SSPC-SP6 ☐ Ferrous Metal Immersion ☐ SSPC-SP10 ☐ SSPC-SP-5 ☐ Other		
COATING	**DFT** mils	**MANUFACTURER AND PRODUCT**
First Coat (Primer)		
Second Coat		
Third Coat		
Total System		Not less than minimum thickness specified.
Notes: (Attached if needed.)		
Project:		
Coatings Manufacturer:		Initials _____
Painting Applicator:		Initials _____

BLACK & VEATCH	COATING SYSTEM DATA SHEET	Fig 1-09940

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SYSTEM NO. - -F

SURFACE PREPARATION DESCRIPTION
☐ Solvent SSPC-SP1
☐ Other

COATING	DFT mils [µm]	MANUFACTURER AND PRODUCT
Shop Primer		(Identify Product/Type)
Touchup		
Intermediate Coat		
Finish Coat		
Total System		Not less than minimum thickness specified.

Notes: (Attached if needed.)

Project:	
Coatings Manufacturer:	Initials _____
Painting Applicator:	Initials _____

BLACK & VEATCH	COATING SYSTEM DATA SHEET	Fig 2-09940

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SECTION 10400 - IDENTIFYING DEVICES

PART 1 - GENERAL

1.1 SCOPE

A. This section covers the furnishing and installing of equipment identification nameplates, signs, tags, and identification devices, such as warning signs and symbols, which indicate hazards, identify objects, rooms and devices, provide instruction, and convey information with the intent to eliminate, in so far as possible, accidental injury to workers and the public or damage to the property.

1.2 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only. Where a date is given for reference standards, that edition shall be used. Where no date is given for the reference standards, the latest edition available shall be used.

1. Regional Office of the U.S. Dept. of Labor, Occupational Safety and Health Administration 29 CFR 1910
2. International Building Code (IBC) and Cincinnati Building Code
3. International Mechanical Code (IMC)
4. International Fire Code (IFC)
5. International Plumbing Code (IPC)
6. National Electric Code
7. Americans with Disabilities Act Accessibilities Guidelines (Federal Reqister)
8. NFPA 101 - Life Safety Code
9. NFPA 704 “Diamond” Hazard Identification systems
10. ANSI Z535.1, ANSI Z535.2, ANSI Z535.3, ANSI Z535.4, ANSI Z535.5, ANSI A13.1, ANSI A117.1

1.3 GENERAL

A. Identifying tags and signs shall be manufactured by firms regularly engaged in the production of high quality signs. Graphics and lettering shall be neatly aligned with sharp, clean edges. Signs displaying ragged edges or other indications of poor workmanship will be rejected.

B. The identifying tags and signs shall be provided with all of the necessary connectors, supports, fasteners, and adhesives required for complete finished installation. Contractor shall verify all sign graphics and obtain approval from the local Fire Marshall and Building Official with jurisdictional authority before fabrication.

1.4 SUBMITTALS

A. General Submittals.

1. Drawings, details, specifications, and installation schedules covering all ductile iron pipe and accessories shall be submitted in accordance with the Submittals Procedures section. The drawings and data shall include, but shall not be limited to, the submittals listed in this section.

2. Contractor shall submit the following items in accordance with the requirements specified in Submittals section. Items requiring submittals shall include, but not be limited to, the following:

a. Manufacturer's information, including manufacturer's specifications and installation instructions.

b. Shop drawings consisting of full-size layouts of all signs, including pipe line identification signs, valve tags, equipment nameplates, directional signs incorporating all features, mountings and accessories. Repetitive sign layouts of typical and most restrictive condition shall be submitted. Details of installations shall be submitted showing fasteners and mounting. Style and colors of lettering shall be as selected by the Engineer from manufacturer's standards.

c. Samples of all the sign materials and colors proposed for use on the project. The samples shall be clearly marked to show the manufacturer's name and product identification and shall be submitted along with the manufacturer's technical data and application instructions.

1.5 PROJECT CONDTIONS

A. Contractor shall verify field conditions of the areas of installation, take measurements at the site prior to fabrication, and indicate field dimensions on the shop drawing submittal. Contractor shall coordinate fabrication schedule, delivery and progress schedule with the project manager and project site construction manager to avoid delays.

PART 2 - PRODUCTS

2.1 WARNING SIGNS

A. Warning signs shall be furnished and installed in the specified location and with the specified wording as indicated below.

B. Each sign shall be in accordance with the Federal Occupational Safety and Health Act - OSHA Regulations 1910.145. The signs shall be 14 inches by 10 inches, and shall be plastic, semi-rigid "01900 Series" Industrial Safety and Security Co., Lima, Ohio. Signs shall be as follows:

1. The following sign shall be installed on hatches with access ladders leading into the new valve vaults into which employees may enter.

DANGER

CONFINED SPACE

AUTHORIZED PERSONNEL ONLY

PART 3 - EXECUTION

3.1 GENERAL

A. Signs shall conform OSHA Federal Register Part 2, Paragraph 1910.45. Locations, sizes, and colors shall be as reviewed by the Engineer. The lettering sizes shall be three-inch in height unless shown or specified otherwise.

3.2 CLEANING

A. In accordance with the requirements of the manufacturer’s printed recommendations, all signs shall be thoroughly cleaned and left ready for use.

End of Section

DIVISION 11 – EQUIPMENT

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SECTION 11060 - EQUIPMENT INSTALLATION

PART 1 - GENERAL

1.1 SCOPE

A. This section covers general installation requirements of new equipment units that have been purchased by Contractor as part of this Work. Equipment specific installation requirements are covered in the equipment sections.

1.2 GENERAL

A. Equipment installed under this section shall be erected and placed in proper operating condition in full conformity with Drawings, Specifications, engineering data, instructions, and recommendations of the equipment manufacturer, unless exceptions are noted by Engineer.

B. Coordination

C. When manufacturer's field services are provided by the equipment manufacturer, Contractor shall coordinate the services with the equipment manufacturer. Contractor shall give Engineer written notice at least 30 days prior to the need for manufacturer's field services furnished by others.

D. Flanged connections to equipment including the bolts, nuts, and gaskets are covered in the appropriate pipe specification section.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Storage

1. Upon delivery, all equipment and materials shall immediately be stored and protected by Contractor in accordance with the Product Storage and Handling Requirements section until installed in the Work. Equipment shall be protected by Contractor against damage and exposure from the elements. At no time shall the equipment be stored on or come into contact with the ground, grass, or any other type of vegetation. Contractor shall keep the equipment dry at all times.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Materials shall be as follows:

Grout	As specified in the Grouting section.
Anti-Seize thread lubricant for SS bolts	As specified in the Anchorage in Concrete and Masonry section.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Equipment shall not be installed or operated except by, or with the guidance of, qualified personnel having the knowledge and experience necessary to obtain proper results as specified in the Startup Requirements section.

B. Each equipment unit shall be leveled, aligned, and shimmed into position. Installation procedures shall be as recommended by the equipment manufacturer and as required herein. Shimming between machined surfaces will not be permitted.

C. Anti seize thread lubricant shall be liberally applied to the threaded portion of all stainless steel bolts during assembly. For equipment installed in contact with raw, partially-treated, or treated potable water, the anti-seize lubricant shall be NSF-61 product certified.

D. When specified in the equipment sections, the equipment manufacturer shall provide installation supervision and installation checks. For installation supervision, the manufacturer’s field representative shall observe, instruct, guide, and direct Contractor's erection or installation procedures as specified in the equipment specifications. For installation checks, the manufacturer’s field representative shall inspect the equipment installation immediately following installation by Contractor, and observe the tests indicated in the Startup Requirements section. The manufacturer's representatives shall revisit the site as often as necessary to ensure installation satisfactory to Owner.

E. All equipment shall be protected after installation, prior to final acceptance by Owner. Protection provisions shall be as recommended by the manufacturer, and shall include provisions to prevent rust, mechanical damage, and foreign objects entering the equipment.

3.2 STARTUP AND TESTING

A. Startup requirements, and tests associated with startup shall be as indicated in the Startup Requirements section. Other field tests shall be as indicated in the specific equipment sections. Startup and tests required shall occur in the order listed in the following paragraphs. Tests shall not begin until any installation supervision and installation checks by the equipment manufacturer have been completed, except where noted below.

B. Preliminary Field Tests. Preliminary field tests shall be conducted on all equipment by Contractor as indicated in the Startup Requirements section. When an installation check is specified in the equipment sections, the equipment manufacturer's representative shall participate in these tests to the extent described in the Startup Requirements section and in the equipment sections.

C. Field System Operation Tests. Field system operation tests shall be conducted on all equipment by Contractor as indicated in the Startup Requirements section. When an installation check is specified in the equipment sections, the equipment manufacturer's service personnel shall participate in these tests to the extent described in the Startup Requirements section and in the equipment sections.

D. Field Demonstration Tests. Field demonstration tests shall be conducted by the equipment manufacturer on equipment as indicated and as specified in the equipment sections.

E. Field Performance Tests & Distribution Tests. Field performance tests or distribution tests shall be conducted by the equipment manufacturer on equipment as indicated and as specified in the equipment sections.

F. Field Baseline Performance Tests. Field baseline performance tests shall be conducted by Contractor on the equipment indicated in the equipment sections, and the tests shall be performed as indicated. When indicated in the equipment sections, the equipment manufacturer shall participate in these tests. This test shall not be considered an acceptance test, but rather a test to determine initial performance curves and efficiency just prior to the equipment entering service.

End of Section

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SECTION 11145 - SUBMERSIBLE VERTICAL TURBINE WELL PUMPS

PART 1 - GENERAL

1.1 SCOPE

A. This section covers the furnishing of vertical diffusion vane pumping units as indicated herein:

Pump location	Vertical Well 2-R	Vertical Well 3-R	Vertical Well 4-R	Vertical Well 5-R
Number of pumps	1	1	1	1
Pump tag numbers	VW-2-R	VW-3-R	VW-4-R	VW-5-R

B. Each pumping unit shall be complete with submersible electric motors; bowl assemblies, discharge column pipes, electrical cables, water level test lines (air lines), and all other appurtenances specified or otherwise required for proper operation.

1.2 GENERAL

A. Equipment furnished and installed under this section shall be fabricated, assembled, erected, and placed in proper operating condition in full conformity with drawings, specifications, engineering data, instructions, and recommendations of the equipment manufacturer, unless exceptions are noted by the Engineer. Hydraulic considerations and definition of terms shall be as set forth in the Hydraulic Institute Standards. Wells shall be of the gravel wall type provided with a permanent inner casing and continuous slot screen.

B. General Equipment Stipulations

1. Unless otherwise specified, the General Equipment Stipulations shall apply to all equipment furnished under this section.

C. Seismic Design Requirements

1. Seismic design requirements for products specified herein shall be as indicated in the Meteorological and Seismic Design Criteria section.

D. Governing Standard

1. Except as modified or supplemented herein, all vertical diffusion vane pumps shall conform to the applicable requirements of ANSI/AWWA E102 and the Hydraulic Institute Standards.

E. Tagging

1. Each item of equipment and each part shipped separately shall be tagged and identified with indelible markings for the intended service. Tag number shall be clearly marked on all shipping labels and on the outside of all containers.

F. Power Supply

1. Power supply to equipment will be 2400 volts, 60 Hz, 3 phase.

G. Identification

1. Pumps shall be identified in accordance with the Equipment and Valve Identification section.

1.3 SUBMITTALS

A. Drawings and Data

1. Complete fabrication, assembly, foundation, and installation drawings, together with detailed specifications and data covering materials, parts, devices, and accessories forming a part of the equipment furnished, shall be submitted in accordance with the Submittals section. The data and specifications for each unit shall include, but shall not be limited to, the following:

Pumps

Name of manufacturer.
Type and model.
Rotative speed.
Size of discharge elbow outlet.
Net weight of pump and motor only.
Complete performance curves (full speed and reduced speed conditions) showing capacity versus head, bhp, NPSH required, and efficiency.
Data on shop painting.

Motors

Name of manufacturer.
Type and model.
Type of bearings and method of lubrication.
Rated size of motor, hp
Temperature rating.
Full load rotative speed.
Net weight.
Efficiency at full load and rated pump condition.
Full load current.
Locked rotor current.
Motor shroud size.
Motor protective instrumentation.

Complete Pumping Unit

Max overall dimensions
Total weight (including riser pipe)
Anchorage calculations and details signed and sealed by a licensed Civil Engineer in the State of Missouri.

Moisture Detection System

Name of manufacturer.
Type and model.
Enclosure rating and layout if an enclosure is specified.
Electrical schematics and wiring diagram.
Published descriptive data on each item of equipment and all accessories, indicating all specific characteristics and options.

Control Panel and Components

Name of manufacturer.
Type and model.
Dimensions and net weight of complete panel.
Overcurrent characteristics and details of motor control.

B. Operation and Maintenance Data and Manuals

1. Operation and maintenance manuals shall be submitted in accordance with the Submittals Procedures section. The operation and maintenance manuals shall be in addition to any instructions or parts lists packed with or attached to the equipment when delivered.

1.4 Quality Assurance

A. Balance

1. All rotating parts shall be accurately machined and shall be in as nearly perfect rotational balance as practicable. Excessive vibration shall be sufficient cause for rejection of the equipment. The mass of the unit and its distribution shall be such that resonance at normal operating speeds is avoided. In any case, the unfiltered vibration velocity, as measured at any point on the machine, shall not exceed 0.17 in/s.

2. At any operating speed, the ratio of rotative speed to the critical speed of a unit or its components shall be less than 0.8 or more than 1.3.

B. Efficiency Evaluation

1. If the efficiency, as determined by the shop test, is below the specified minimum efficiency, Owner may, at his option, reject the unit.

C. Local Representation

1. The pump supplier shall have a local representative with a permanent place of business within 750 miles of the site and shall guarantee a maximum response time of 8 hours to have a qualified employee report to the site upon notification by the Owner of an emergency situation requiring such action.

D. Warranty

1. All equipment furnished under this section shall be free from defects in workmanship, design, and materials, and performance shall be guaranteed for the entire warranty period. Any material or equipment failing during the warranty period shall be repaired or replaced by the manufacturer at no cost to Owner.

E. Spare Parts

1. The following spare parts and accessories shall be furnished in substantial wooden boxes with identifying labels and delivered to the vicinity of the project site, as follows:

Spare Parts	Quantity
O-rings	1 set per pump
Seals	1 set per pump
Gaskets	1 set per pump
Mechanical seals	1 set per pump
Knock out drain plugs on check valves	2 per pump

F. Special Tools and Accessories

1. Equipment requiring periodic repair or adjustment shall be furnished complete with all special tools, instruments, and accessories required for proper maintenance. Equipment requiring special devices for lifting or handling shall be furnished complete with those devices.

PART 2 - PRODUCTS

2.1 SERVICE CONDITIONS

A. Submersible Vertical Turbine Well Pumps to be used for raw river water within a vertical well.

Seismic design requirements.	See Meteorological and Seismic Design Criteria section	
Liquid temperature range.	55 to 85	°F
Solids concentration, percent by weight.	0	%
Pumps start and stop against a closed valve.	Yes	
Site elevation.	See Meteorological and Seismic Design Criteria section	
Units subject to freezing temperatures.	No	

Size of solids	<0.1	in
Crane facilities available.	No	

2.2 PERFORMANCE AND DESIGN REQUIREMENTS

A. Each pumping unit shall be design to operate as stand alone units and in parallel with the other well. The following design requirements are for stand-alone operation only. Pumping units shall be designed for the following operating conditions and requirements:

Unit designation.	VW-2R	VW-3R	VW-4R	VW-5R	UNIT
Rated total head.	129	120	124	122	ft
Capacity at rated head.	3,125	1,250	3,000	2,700	gpm
Maximum pump operating speed at rated head.	1800	1800	1800	1800	rpm
Maximum power required at any point in the operating head range.	199	67	140	140	bhp
Efficiency at rated head, wire-to-water.	77	77	77	77	%
Operating head range for full speed continuous operation..	112	102	102	102	ft
Minimum capacity at Maximum Operating Head during full speed continuous operation..	1595	830	1665	1665	gpm
Nominal size of pump discharge.	12	10	12	12	in
Minimum diameter of pump column.	12	10	12	12	in
Minimum column length.	75	80	65	70	ft
Minimum hydrostatic test pressure.	210	145	165	165	psig
Minimum Submergence	4.6	2.7	4.5	4.1	ft

B. Minimum shop test pressure on bowl assembly shall be 1.5 times the shutoff head plus maximum suction pressure where applicable.

C. For design and rating purposes, the water to be pumped shall be assumed to have a temperature of 68° F. The rated performance of the pumping unit shall include the losses in the discharge pipe, discharge elbow, and cable losses.

D. Pump performance shall be stable and free from damaging cavitation, vibration, and noise in the operating head range. The performance of the pump shall be based on a radial running clearance between the bowl wearing ring and the impeller of not less than 6 mils or 0.5 mil per inch of wearing ring diameter, whichever is greater.

E. The pumping unit shall be designed so that maximum reverse rotation due to reverse flow at rated head will not cause damage to any component.

2.3 MATERIALS

Pump Bowls	Cast iron, ASTM A48.
Impellers	Bronze, ASTM B584.
Impeller Wearing Rings	Martensitic stainless steel, Brinell 200-250.
Bowl Wearing Rings	Martensitic stainless steel, Brinell 300+.
Bowl Assembly Shaft	Martensitic stainless steel, AISI Type 410 or 416.
Bowl Bearings	Bronze, ASTM B584, water lubricated, except top case bearing shall be permanently packed with water-resistant grease.
Pump Discharge Column	ASTM A53, Grade A standard weight steel pipe, with flanged couplings.
Motor Shroud	ASTM A53, Grade A standard weight steel
Drawdown Gauge Tubing and Fittings	3/8 inch Polyethylene tubing.
Strainer	Stainless steel.
Pump Motor Coupling	Stainless steel
Cable Clamps	Stainless steel
Motor Cable Splice	Metal or plastic
Conductor Guard	Stainless steel
Cable Seal Gland	Bronze
Pump Column Assembly, Anchor Bolts, Nuts, and Washers	316 Stainless steel
Thread Lubricant	
Pipe Threads	Teflon paste type thread sealer , suitable for potable water service.
Lineshaft Coupling Threads	Jet-Lube "Nikal", John Crane "Thred Gard Nickel", Never-Seez "Pure Nickel Special", or

	Permatex "Nickel Anti-Seize".
Epoxy Coating	
Primer (First Coat)	Carboline "Kop-Coat Hi-Gard Epoxy" or Engineer approved Equal.
Finish Coat	Carboline "Kop-Coat Hi-Gard Epoxy" or Engineer approved Equal.

2.4 PUMP CONSTRUCTION

A. Suction Bowl Inlet

1. Well pumps shall be equipped with a suction strainer. Net opening of the suction strainer shall be at least 2 1/2 times the inlet area of the pump.

B. Impellers and Bowls

1. Impellers shall be accurately machined, dynamically balanced and securely locked on the pump shaft.

2. Balance rings which depend upon close running clearances to reduce the load on the drive unit thrust bearing will not be acceptable unless otherwise indicated.

3. Pump bowls and impellers shall be equipped with wearing rings designed to maintain pump efficiency. Wearing rings shall be securely locked in place so that they will not move or loosen during any condition of operation or handling, including reverse rotation of the pump.

C. Shafting

1. All pump shafting shall conform to the applicable sections of the governing standard. Shaft diameter shall be not less than the minimum permitted for the applicable driver nameplate power rating.

D. Pump Column

1. The pump column length shall be as indicated on the Drawings.

2. Column sections shall be provided with lifting lugs or dogs to facilitate pump removal. Lifting lugs or dogs shall be a least 12 inches below the column flange and shall be designed to prevent deflection of the column flange. Lifting lugs shall be suitable for lifting the entire weight of the suspended pump assembly.

3. The discharge pipe shall include a surface plate to cover the pump column and connect the inside and outside the pump column. The surface plate shall have a 1” connection with gooseneck vent and bug screen.

E. Mechanical Seal

1. The stuffing box shall be provided with a single mechanical seal suitable for vertical turbine pump service.

F. Surface Plate

1. The surface plate shall be configured with connections for sounding tubes, electrical conduit, vent and instrumentations as shown on the drawings. The sole plate shall be equipped with lifting lugs of adequate strength to lift the entire pumping unit, column pipe full of water, sounding tubes, and all other downhole equipment.

2. If the well casing below the discharge elbow shall be encased in concrete the sole plate shall have tapped bolt holes.

G. Shop Painting

1. All iron and steel parts which will be in contact with pumped liquid or submerged after installation, including the inside of the casing, the impeller, and the discharge elbow, shall be shop cleaned in accordance with the coating manufacturer's recommendations and painted with an epoxy coating system. The coating shall have a dry film thickness of at least 10 mils and shall consist of a prime (first) coat and one or more finish coats. At least 1 quart of the finish coat material shall be furnished with each pump for field touchup.

H. Pitless Adapter

1. Each pump shall be furnished with a pitless adapter in accordance with the Water Wells section.

I. Motor Shroud

1. Each pump shall be furnished with a motor shroud sized based on manufacturer recommendation.

2.5 ACCESSORIES

A. Drawdown Gauge

1. A 3/8 inch polyethylene tube shall be provided on each pump to measure drawdown. Drawdown tubing shall extend from the pump discharge head to a point one foot above the pump inlet fitting.

2. A direct reading drawdown gauge assembly shall be mounted on each pump discharge head. The gauge shall be 4-1/4 inches in diameter, graduated in feet of water from 0-390 and shall be U.S. Gauge "Type A566". The gauge assembly shall include a mounting bracket and a valve stem for air connection. A handle air pump shall be provided for each unit.

B. Check Valves

1. One check valve shall be supplied with the column pipe for the pump and be of size and thread pattern to match the column pipe size. The check valve shall be of stainless steel construction, provide a positive seal, rated at 500 psi minimum, be of poppet style design and shall have a tensile strength equal to or greater than the column pipe. The outside diameter of the check valves shall be equal to or smaller than the outside diameter of the drop pipe couplings. The check valve shall include an integral knock out drain valve. The check valve shall be designed to be placed 10 feet up from the pump end and seal when closed against a full column of water.

C. Air Release Connection

1. An outlet connection shall be provided for mounting an air and vacuum valve as specified in the Air Valves section and as shown on the Drawings.

2.6 DRIVE UNITS

A. Electric Motors

1. Each pumping unit shall be furnished with a completely enclosed submersible motor suitable for continuous duty under water and sized for the load conditions specified herein.

2. Motor service factor shall be 1.15. Each motor shall be suitable for starting with a full voltage non-reversing starter. The motors shall be designed to operate on a power system that may contain up to 5 percent of harmonic distortion.

3. Submersible motors shall be water/glycol-filled suitable for use in submersible motors in potable water pumping applications. The water/glycol shall be continuously circulated throughout the motor for cooling and lubrication of rotor, stator, and bearings. The motors shall have a pressure balancing system which shall maintain a pressure balance between the internal and external fluids.

4. Each motor shall be equipped with a double mechanical seal or similar type premium seal which is designed to prevent contaminants from reaching the interior of the motor. Mercury type seals will not be acceptable.

5. The motors shall incorporate downthrust bearings which are capable of supporting the entire weight of all rotating components plus the hydraulic thrust developed by the pump. The motors shall also have an upthrust bearing with a load rating of at least equal to 25% of the downthrust rating.

B. Power Cables

1. Each pump motor shall be furnished with power and control cables suitable for installation in a submerged environment. The manufacturer cables shall connect the motor terminals and protective instrumentation to junction boxes above the well surface plate for connection to the motor starter.

2. The power cables shall comply with all applicable requirements of the NEC and shall be sized as required. Power cables shall be insulated to at least 2400 volts ac with insulation suitable for service connections. Control conductors shall be furnished sized as required to facilitate connection with the furnished protective instrumentation as specified, insulated to a minimum of 600 volts ac. All cables shall comply with NEC standards. The cables shall be supported by suitable non-corrosive, non-magnetic means to prevent heavy loading on the cable connections in the junction box.

C. Voltage Surge Protection

1. Each motor shall be furnished with surge capacitors and station-class lightning arresters sized to limit voltage surges to magnitudes which will not damage motor winding insulation. Surge capacitors and lightning arresters shall be located in or adjacent to the power cable junction box.

D. Controls

1. Motors shall be furnished with a pair of resistive temperature devices (RTDs) placed in each phase winding to sense winding temperature, and shall be equipped with RTDs in the thrust and guide bearings. Bearing RTDs complete with detector head and holder assemblies shall be furnished in accordance with the applicable requirements of ISA MC96.1 and IEEE 119. All RTDs shall be 100 ohm, platinum type, and shall be connected with a twisted shielded triad to the motor protection relay, located in each associated starter enclosure, as indicated on the Drawings. Each motor housing shall be provided with a moisture detection system complete with all sensors, control power transformers, intrinsically safe control modules, and relays. The moisture detection system shall be rated for a 120-volt ac supply. The moisture detection system shall provide two normally open dry output contacts rated 5 amps at 120 volts ac. The contacts shall close when moisture is detected in the motor housing. All moisture detections system components shall be furnished by the pump supplier and shall be mounted within the motor enclosure and wired to a separately mounted moisture detection relay (MDR). MDR shall be furnished by the motor supplier and installed by the contractor in each associated starter enclosure as indicated on the Drawings.

2.7 SHOP TESTS

A. Each pumping unit shall be tested at the factory for capacity, power requirements, and efficiency at specified rated head, shutoff head, operating head extremes, and at as many other points as necessary for accurate performance curve plotting. All tests and test reports shall conform to the requirements and recommendations of the Hydraulic Institute Standards. Acceptance testing shall be Table 14.6.3.4 Grade 1U, with no minus tolerance or margin allowed.

B. Five certified copies of a report covering each test shall be prepared by the pump manufacturer and delivered to the Engineer not less than 10 days prior to the shipment of the equipment from the factory. The report shall include data and test information as stipulated in the Hydraulic Institute Standards, copies of the test log originals, test reading to curve conversion equations, and certified performance curves. The curves shall include head, bhp, pump efficiency, and

shop test NPSH available, plotted against capacity. The curves shall be easily read and plotted to scales consistent with performance requirements. All test points shall be clearly shown.

C. Two (2) Owner's Representatives will witness shop tests, inspect and check the testing equipment used, and observe the calibration of pressure gauges and transducers. Contractor shall funish Representatives a plan and elevation sketch of the test setup showing the piping and instrumentation and shall notify Representatives at least 10 days in advance of the time of each shop test. For witnessed tests, all readings are to be read manually from the certified and/or calibrated instruments. The use of computer data acquisition systems will not be acceptable.

D. If the pump fails to operate properly or fails to meet the specified conditions or requirements during witnessed shop testing, the pump manufacturer shall modify the pumping unit and perform additional tests. Labor, travel, and expenses associated with the witnessing or observation of additional tests, whether due to incomplete tests or re-testing, shall be paid by the pumping unit supplier.

PART 3 - EXECUTION

3.1 INSTALLATION

A. An experienced, competent, and authorized representative of the manufacturer shall visit the site of the Work and inspect, check, adjust if necessary, and approve the equipment installation. The representative shall be present when the equipment is placed in operation in accordance with Startup Requirements section, and shall revisit the job site as often as necessary until all trouble is corrected and the equipment installation and operation are satisfactory in the opinion of Engineer.

B. The manufacturer's representative shall furnish a written report certifying that the equipment has been properly installed and lubricated; is in accurate alignment; is free from any undue stress imposed by connecting piping or anchor bolts; and has been operated under full load conditions and that it operated satisfactorily.

C. All costs for these services shall be included in the contract price.

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DIVISION 13 – SPECIAL CONSTRUCTION

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SECTION 13500 - INSTRUMENTATION AND CONTROL SYSTEM

PART 1 - GENERAL

1.1 SCOPE

A. This section covers the furnishing and installation of an instrumentation and control system designated as the Plant Control System.

B. The system shall be furnished as specified, complete with all software, human machine interface (HMI) hardware, input/output hardware, instrumentation, and all devices, accessories, appurtenances, testing, and training necessary for proper operation.

C. Scope of works shall include the following in addition to requirements specified herein and in the Associated Sections below.

1. Provision of vertical well pressure and level instrumentation.

2. Provide and program the new Well PLC-6.

3. Program Owner's SCADA System (Transdyn/Kapsch DYNAC System) to incorporate Vertical Well monitoring and control requirements.

4. Provide all ancillary panels, including the Level Panel which will indicate the level in each vertical well.

5. Provide fiber optic cable, terminations, and testing for a working communication network between PLC-6 and the Intake Pump Station PLC.

6. Testing, training, and commissioning services as specified herein.

D. Associated Sections

1. This section also includes the equipment and services specified in the following sections.

Section 13530	PROGRAMMABLE LOGIC CONTROLLERS
Section 13550	SOFTWARE CONTROL BLOCK DESCRIPTIONS
Section 13561	PANEL MOUNTED INSTRUMENTS
Section 13562	FLOW INSTRUMENTS
Section 13563	PRESSURE AND LEVEL INSTRUMENTS
Section 13570	PANELS, CONSOLES, AND APPURTENANCES

Section 13590 PROCESS CONTROL NETWORK SYSTEMS

Section 13591 METALLIC AND FIBER OPTIC CABLE

1.2 GENERAL

A. Equipment furnished and installed under this section shall be fabricated, assembled, and placed in proper operating condition in full conformity with the Drawings, Specifications, engineering data, instructions, and recommendations of the equipment manufacturer, unless exceptions are noted by Engineer.

B. General Equipment Stipulations

1. The General Equipment Stipulations shall apply to all equipment and materials furnished under this section. If requirements in this specification differ from those in the General Equipment Stipulations, the requirements specified herein shall take precedence.

C. Drawings

1. The Drawings indicate locations and arrangements of equipment and may include installation details and block and one-line diagrams showing connections and interfaces with other equipment. The input/output (I/O) lists are attached as an appendix to the Programmable Logic Controllers section.

2. Principal components of the instrumentation systems shall be as indicated on the instrument device schedule attached to this section.

D. Codes, Permits and Agency Approvals

1. All work performed and all materials used shall be in accordance with the National Electrical Code, and with applicable local regulations and ordinances. Where mandated by codes, panels, assemblies, materials, and equipment shall be listed by Underwriters' Laboratories. Contractor shall, as part of their work, arrange for and obtain all necessary permits, inspections, and approvals by the authorities having local jurisdiction of such work. This shall include any third-party inspections and testing of panels and equipment.

E. Supplier’s Qualifications

1. Equipment and software furnished under this section and under other related sections listed in the Scope paragraph above shall be designed, coordinated, and supplied by a single manufacturer or supplier, hereinafter referred to as the System Supplier. The System Supplier shall be one of the listed firms below:

a. Durkin/Process Control Systems, St. Louis, MO (314-432-2040).
b. R.E. Pedrotti Co., Mission, KS (913-677-3366).
c. Integrated Controls, Inc., Olathe, KS (913-782-9600).

2. One of the following firms shall be subcontracted by the System Supplier to provide Trandyn/Kapsch DYNAC programming services:

   a. CDM Smith, Kansas City, MO (816-44-8270).
   b. R.E. Pedrotti Co., Mission, KS (913-677-3366).
   c. Transdyn/Kapsch, Duluth, GA (678-473-6430).

F. Coordination

1. Systems supplied under this section shall be designed and coordinated by System Supplier for proper operation with related equipment and materials furnished by other suppliers under other sections of these specifications, under other contracts, and, where applicable, with related existing equipment. All equipment shall be designed and installed in full conformity with the Drawings, specifications, engineering data, instructions, and recommendations of the manufacturer, and the manufacturer of the related equipment.

G. Related Equipment and Materials

1. Related equipment and materials may include, but will not be limited to, instrumentation, motor controllers, valve actuators, chemical feeders, analytical measuring devices, conduit, cable, and piping as described in other sections or furnished under other contracts.

H. Device Tag Numbering System

1. All devices shall be provided with permanent identification tags. The tag numbers shall agree with System Supplier's equipment drawings and shall be as close as practical to the tag numbers used on the Drawings and device schedules. All field-mounted transmitters and devices shall have stamped stainless steel identification tags. Panel, subpanel, and rack-mounted devices shall have laminated phenolic identification tags securely fastened to the device. Hand-lettered or tape labels will not be acceptable.

1.3 GENERAL REQUIREMENTS

A. The Drawings and Specifications indicate the extent and general arrangement of the systems. If any departures from the Drawings or Specifications are deemed necessary by System Supplier, details of such departures and the reasons shall be submitted to Engineer for review with or before the first stage submittal. No departures shall be made without prior written acceptance.

B. The specifications describe the minimum requirements for hardware and software. Where System Supplier's standard configuration includes additional items of equipment or software features not specifically described herein, such equipment or features shall be furnished as a part of the system and shall be warranted as specified herein.

C. Governing Standards

1. Equipment furnished under this section shall be designed, constructed, and tested in accordance with IEEE 519, ANSI C37.90, FCC Part 15 - Class A, and NEMA ICS-1-109.60.

D. Dimensional Restrictions

1. Layout dimensions will vary between manufacturers and the layout area indicated on the Drawings is based on typical values. The System Supplier shall review the Drawings, the manufacturer's layout drawings and installation requirements, and make any modifications requisite for proper installation subject to acceptance by Engineer. At least three feet of clear access space shall be provided in front of all instrumentation and control system components.

E. Workmanship and Materials

1. System Supplier shall guarantee all equipment against faulty or inadequate design, improper assembly or erection, defective workmanship or materials, and leakage, breakage, or other failure. Materials shall be suitable for service conditions.

2. All equipment shall be designed, fabricated, and assembled in accordance with recognized and acceptable engineering and shop practice. Individual parts shall be manufactured to standard sizes and thicknesses so that repair parts, furnished at any time, can be installed in the field. Like parts of duplicate units shall be interchangeable. Equipment shall not have been in service at any time prior to delivery, except for testing.

F. Corrosive Fluids

1. All parts which are exposed to corrosive conditions shall be made from corrosion resistant materials. System Supplier shall submit certification that the instrument manufacturer approves the selection of materials of primary elements that are in contact with the specified process fluid to be inert to the effects of the process fluid.

G. Appurtenances

1. Signal converters, signal boosters, amplifiers, special power supplies, special cable, special grounding, and isolation devices shall be furnished as needed for proper performance of the equipment.

H. Programming Devices

1. A programming or system-configuring device shall be provided for systems that contain any equipment that requires such a device for routine calibration, maintenance, and troubleshooting. The programming device shall be complete, newly purchased for this project, and shall be in like-new condition when turned over to Owner at completion of startup.

I. Instrument Cleaning

1. Instruments to be utilized in oxygen, ozone, or similar service shall be cleaned for oxygen service, labeled appropriately, and bagged or packaged as necessary to ensure the instrument will remain suitable for insertion in the process during installation. Any special mounting or installation requirements associated with such instruments shall be detailed on tags attached to the instrument.

1.4 SUBMITTALS

A. General

1. Complete dimensional, assembly, and installation drawings, wiring and schematic diagrams; and details, specifications, and data covering the materials used and the parts, devices and accessories forming a part of the system furnished, shall be submitted in accordance with the submittals section. Submittal data shall be grouped and submitted in three separate stages. The submittal for each stage shall be substantially complete. Individual drawings and data sheets submitted at random intervals will not be accepted for review. Equipment tag numbers or identifications used on the Drawings shall be referenced where applicable.

B. First Stage Submittal

1. The first stage submittal shall include the following items.

a. A detailed list of any exceptions, functional differences, or discrepancies between the system proposed by System Supplier and this specification.

b. Product catalog cut sheets on all hardware and software items, clearly marked to show the model number, optional features, and intended service of each device.

c. A brief, concise description of the proposed system, including major hardware and software components and personnel training.

d. A block diagram or schematic drawing showing the principal items of equipment furnished, including model numbers, and their interrelationships.

e. Drawings showing floor and wall space or desktop area requirements for all equipment items, including allowances for door swings and maintenance access.

f. Environmental and power requirements, including heat release information for each equipment item.

g. Standard field termination drawings for all process input/output equipment, showing typical terminations for each type of point available in the system.

h, Outline for training classes.

i. Additional requirements identified in other Division 13 sections.

C. Second Stage Submittal

1. Before any equipment is released for shipment to the site and before factory testing is scheduled, the following data shall be submitted.

2. At System Supplier's option, the first and second stage submittals may be combined.

a. Detailed functional descriptions of all software modules specified and furnished as part of System Supplier's standard system. The descriptions shall be identified with the applicable specification paragraph.

b. Complete panel fabrication drawings and details of panel wiring, piping, and painting. Panel and subpanel drawings shall be to scale and shall include overall dimensions, metal thickness, door swing, mounting details, weight, and front of panel arrangement to show general appearance, with spacing and mounting height of instruments and control devices.

c. Wiring and installation drawings for all interconnecting wiring between components of the system and between related equipment and the equipment furnished under this section. Wiring diagrams shall show complete circuits and indicate all connections. If panel terminal designations, inter-device connections, device features and options, or other features are modified during the fabrication or factory testing, revised drawings shall be submitted before shipment of the equipment to the site.

d. Fiber termination diagrams to show all fiber terminations at fiber patch panels and final termination at equipment. Fiber termination diagrams shall show individual fiber type (single or multimode), fiber core/cladding dimensions, fiber colors, circuit identifications, and type of terminator.

e. Review of drawings submitted prior to the final determination of related equipment shall not relieve System Supplier from supplying systems in full compliance with the specific requirements of the related equipment.

f. Input/output listings showing point names, numbers, and addresses. Input/output identification numbers from the contract documents shall be cross-referenced in this submittal.

g. Proposed lesson plans or outlines for all training courses specified herein, including schedule, instructors' qualifications and experience, and recommended prerequisites.

h. Standard system engineering and user manuals describing the use of the system and application programming techniques for creating reports, graphics, database, historical records, and adding new process I/O nodes to the system.

i. Additional Requirements identified in other Division 13 sections.

D. Third Stage Submittal

1. Complete system documentation, in the form of Operation and Maintenance Manuals, shall be submitted before the commencement of field acceptance testing. Operation and Maintenance Manuals shall include complete instruction books for each item of equipment and software furnished. Where instruction booklets cover more than one specific model or range of device, product data sheets shall be included which indicate the device model number and other special features. A complete set of "as-built" wiring, fabrication, and interconnection drawings shall be included with the manuals. If field-wiring modifications are made after these drawings are submitted, the affected drawings shall be revised and resubmitted. Additional requirements are identified in other Division 13 specification sections.

1.5 PREPARATION FOR SHIPMENT

A. All electronic equipment and instruments shall be suitably packaged to facilitate handling and to protect against damage during transit and storage. All equipment shall be boxed, crated, or otherwise completely enclosed and protected during shipment, handling, and storage. All equipment shall be protected from exposure to the elements, shall be kept dry at all times, and shall not be exposed to adverse ambient conditions.

B. Painted surfaces shall be protected against impact, abrasion, discoloration, and other damage. Painted surfaces that are damaged prior to acceptance of equipment shall be repainted to the satisfaction of Engineer.

C. Each shipment shall include an appropriate shipping list that indicates the contents of the package, including the specific instrument tags. The shipping list shall be accessible without exposing the instruments to the atmosphere. The shipping list shall also contain any cautionary notes regarding storage of the instruments, including requirements to protect the instrument from static discharge, desensitizing chemicals (solvents, paints, etc.), or ambient atmospheric conditions.

D. Individual instruments shall be appropriately tagged or labeled to positively identify the device. All identification shall be visible without the need to unpack the instrument from its protective packaging.

E. Instrument shipment and storage requirements shall be coordinated with Engineer or Owner prior to shipment. System Supplier shall provide adequate storage and be ready to accept the shipment before shipping any equipment to the site. Additional shipping and storage requirements shall be as detailed in the individual instrument specifications.

F. Components which are shipped loose due to transportation limitations shall be assembled and disassembled by the manufacturer prior to shipment to assure that all components fit together and are adequately supported.

1.6 DELIVERY, STORAGE, AND SHIPPING

A. Shipping shall be in accordance with the Product Delivery Requirements section. Handling and storage shall be in accordance with the Product Storage and Handling Requirements section.

1.7 SPARE PARTS

A. Packaging

1. All spare parts shall be delivered to Owner before final acceptance of the system. Packaging of spare parts shall provide protection against dust and moisture and shall be suitable for storage. Circuit boards and other electronic parts shall be enclosed in anti-static material. All packages shall be clearly marked with the manufacturer's name, part number or other identification, date of manufacture, and approximate shelf life.

B. Replacement

1. System Supplier may utilize spare parts and supplies during system installation, de-bugging, startup, or training, but shall restore all such materials and supplies to the specified quantities before final acceptance of the systems.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. All equipment furnished under each section referenced in SCOPE is a part of this section and shall be selected by System Supplier for its superior quality and intended performance. Equipment and materials used shall be subject to review.

B. Standard Products

1. The systems furnished shall be standard products. Where two or more units of the same type of equipment are supplied, they shall be the products of the same manufacturer; however, all components of the systems furnished hereunder need not be the products of one manufacturer unless specified herein.

2. To the extent possible, instruments used for similar types of functions and services shall be of the same brand and model line. Similar components of different instruments shall be the products of the same manufacturer to facilitate maintenance and stocking of repair parts. Whenever possible, identical units shall be furnished.

2.2 PERFORMANCE AND DESIGN REQUIREMENTS

A. The design of the systems furnished hereunder shall utilize concepts, techniques and features that provide maximum reliability and ease of maintenance and repair. The systems shall include

board-level devices such as light emitting diodes or other indicators to facilitate quick diagnosis and repair. Diagnostic software shall be furnished to facilitate system-level troubleshooting.

B. Where redundant hardware is provided, the system shall be capable of performing all specified functions, without reconfiguring hardware or software, with only one device of each category in service.

C. Factory Assembly

Equipment shall be shipped completely factory assembled, except where its physical size, arrangement, configuration, or shipping and handling limitations make the shipment of completely assembled units impracticable.

D. Expandability

1. The system shall be capable of expansion as follows:

Future Requirement	Quantity
I/O points	100%

2.3 POWER SUPPLY AND INSTRUMENT SIGNAL

A. Power supply to all control system equipment will be 120 volts ac. System Supplier shall be responsible for distribution of power among enclosures, consoles, peripherals, and other components of the system from the power supply receptacles and junction boxes indicated on the Drawings. Power distribution hardware shall include cables and branch circuit overcurrent protection installed in accordance with the electrical section.

B. Unless otherwise indicated, power supply to the instrumentation will be unregulated 120 volts ac. Unless otherwise indicated, all transmitted electronic analog instrument signals shall be 4-20 mA dc and shall be linear with the measured variable.

C. Facility Distribution System

1. Equipment not indicated to be powered from an uninterruptible power source shall be suitable for being supplied from the facility distribution system and shall be capable of withstanding voltage variations of ±10 percent and harmonics up to the limits of IEEE 519 without affecting operation. System Supplier shall provide voltage conditioning or filtering equipment if necessary to meet the requirements specified.

D. Power Supplies

1. Power supplies for voltages other than those listed above shall be an integral part of the equipment furnished. Internal power supplies shall be regulated, current limiting, and self-protected.

E. Surge Withstand

1. All equipment shall meet all surge withstand capability tests as defined in ANSI C37.90 without damage to the equipment.

2.4 SERVICE CONDITIONS AND ENVIRONMENTAL REQUIREMENTS

A. The equipment provided for the instrumentation and control system shall be suitable for the service conditions specified in the attached equipment sections.

B. All equipment shall be designed and selected to operate without degradation in performance throughout the environmental extremes specified. Equipment shall be designed to prevent the generation of electromagnetic and radio frequency interference and shall be in compliance with FCC Rules and Regulations, Part 15, for Class A computing devices.

C. Ambient Temperature and Elevation

1. All system equipment located in air-conditioned rooms shall be suitable for operation in ambient temperatures from 10° C to 35° C and a relative humidity of 10 to 80 percent, noncondensing. All equipment located in non-air-conditioned indoor areas shall be suitable for an ambient temperature range of 0° C to 50° C and a relative humidity of 10 to 95 percent, noncondensing. All equipment located outdoors shall be suitable for operation in an ambient temperature range -20° C to 60° C and a relative humidity of 5 to 100 percent. Heaters and air conditioning/cooling equipment shall be provided where essential to maintain equipment within its manufacturer-recommended operating ranges.

2. All equipment and instruments shall be designed to operate at the site elevation of 700 ft.

D. Deleterious Effects

1. All system equipment will be installed in areas without anti-static floor construction and without any provisions for control of particulates or corrosive gases other than ordinary office-type HVAC filtering. System Supplier shall furnish any additional air cleaning equipment, anti-static chair pads, or other protective measures necessary for proper operation of the system.

2. All input/output hardware shall meet or exceed, without false operation, all requirements of NEMA ICS-1-109.60, Electrical Noise Tests.

E. Noise Level

1. The equivalent "A" weighted sound level for any system equipment located in the control room, except printers, shall not exceed 35 dBA. The sound level for printers shall not exceed 65 dBA. Sound reduction enclosures shall be provided where necessary to comply with these limits.

F. Lightning Protection

1. In addition to other environmental protection specified herein, the entire system shall be provided with lightning protection. Lightning protection measures shall include the following.

2. Grounding

a. All major components of the system shall have a low resistance ground connection. Grounding system provisions indicated on the Drawings shall be modified as recommended by System Supplier.

3. Surge Suppressors

a. Surge and lightning suppressors shall be non-faulting, non-interrupting, and shall protect against line-to-line and line-to-ground surges. Devices shall be solid-state metal oxide varistor (MOV) type, silicon junction type, Gas Discharge Tube (GDT) type, or some combination of these types, with a response time of less than 50 nanoseconds. Surge protective devices shall be applied for the following:
   1) All 120 volts ac power connections to RTUs, PLCs, DCUs, instruments and control room equipment. Surge arresters shall be Transtector "SPD 12R Series", Phoenix Contact “PLT-SEC Series”, MCG Surge Protection “400 Series” or equal.
   2) All analog signal circuits where any part of the circuit is outside of the building envelope. Circuits shall be protected at both the transmitter and the control system end of the circuit. Surge protection devices shall not impede or interfere with the use of smart transmitter calibration/communication.
      a) Protection devices located at the field transmitter shall be:
         - Loop Powered Transmitters – Eaton MTL “TP48”, Phoenix Contact “SurgeTrab Series”, Transtector “PDS Outdoor Series” or equal.
         - Four-Wire Transmitters – Phoenix Contact “BoxTrab Series”, Schneider Electric ASCO Model 265, Emerson “SolaHD STC-SLAC Series”, or equal.
      b) Protection devices in control panels shall be Transtector “12R IEP Series”, Eaton MTL “SD Modular Series”, Phoenix Contact “TTC-6P Series”, or equal.

2.5 SOFTWARE DOCUMENTATION

A. System Supplier shall furnish complete documentation on all software supplied with the systems specified herein. Operating systems, compilers, assemblers, and utility and diagnostic programs that are standard commercial products of third parties need not be included in the optical media backup. Software documentation shall consist of the following principal items.

1. One backup set of any integrated circuit or solid-state memory-based plug-in firmware used.

2. Two complete back-up copies of system and application software in executable format on optical media compatible with the system furnished.

3. Three sets of user reference manuals for all standard system and application software.

4. One set of user reference manuals for all operating system software.

5. Three sets of printed as-built reference documentation for any special software provided specifically for this contract.

6. For each licensed software product, all documentation provided by the product manufacturer shall be provided. This includes all reference manuals and any other documents that were provided by the manufacturer. One set of this documentation shall be supplied for each and every piece of equipment provided. Multiple pieces of similar equipment or software require multiple copies of this documentation.

PART 3 - EXECUTION

3.1 INSTALLATION REQUIREMENTS

A. The installation of equipment furnished hereunder shall be by the Contractor or their assigned subcontractors.

B. Field Wiring

1. Field wiring materials and installation shall be in accordance with the electrical section.

C. Instrument Installation

1. Instruments shall be mounted so that they can be easily read and serviced and so that all appurtenant devices can be easily operated. Installation details for some instruments are indicated on the Drawings.

2. All outdoor instrumentation shall be protected from direct sun exposure. Instruments shall be placed in locations to limit south and west sun exposure. Sunshades shall be provided on instruments that are subject to the direct sun exposure. Sunshades shall be located so the opening faces north or east where possible. Sunshades shall be provided as shown on the Drawings.

D. Salvage of Existing Equipment

1. Existing equipment and materials removed or replaced under this contract shall be delivered to Owner at a location designated by Owner or shall be properly disposed of at Owner’s discretion. Care shall be taken to avoid damage to equipment delivered to Owner.

2. Any mounting brackets, enclosures, stilling wells, piping, conduits, wiring, or openings that remain after removal of equipment and support hardware shall be removed or repaired in a manner acceptable to Owner and Engineer. Transmitters or switches containing mercury shall be removed and disposed of by personnel trained in the handling of hazardous materials and using approved procedures.

3.2 SYSTEM SOFTWARE CONFIGURATION

A. The system software will be configured by the System Supplier, and they shall be responsible for the following configuration support tasks:

1. Furnish and install the necessary operating system software, utilities, and all standard software packages. All software provided shall be fully configured for use as specified herein and in related sections. This configuration should include but not limited to, security access from the Administrator functionality to the Operator functions, printing functions (including graphics, reports, system documentation parameters, etc.), reporting functions, and historical interface and historical data accessibility.

2. Furnish and apply all standard communications software and develop any custom communications software needed for the components of the system to communicate information as indicated on the functional block diagram on the Drawings.

3. Configure the hardware and provide any necessary firmware or software programming associated with the hardware, configuration such as PLC device address assignments.

4. Provide complete startup, checkout, and calibration of all system hardware and I/O specified herein.

5. Provide any programming requisite to implementing the features and functions described herein that are not a standard part of the system software.

6. Provide KCMO SCADA systems programming for all equipment being provided and installed under this contract. Coordinate the programming of the SCADA system with the owner to ensure that existing operations are not impacted.

B. Control System Database

1. The control system database shall be developed and configured by the System Supplier. The System Supplier shall enter information obtainable from the Contract Documents into the database prior to soliciting input from the Engineer and the Owner. The System Supplier shall determine the need for any "pseudo" database points and shall ascertain and enter all information needed to define these points. The System Supplier is responsible for entering all information associated with each point. This includes but is not limited to, descriptions, engineering units, associated displays, areas, security, etc. All fields associated with each database point must be completely filled out accurately.

C. Graphic Screen Displays

1. The System Supplier shall be responsible for developing and configuring the custom graphic displays. Each piece of major process equipment that is monitored by the control system shall be displayed on one or more graphic screen. Graphic screens shall be representations of the equipment and piping. The screens must accurately show all devices and equipment that is part of the control loops. These items must be done in accordance to the Configuration Standards and Conventions as described later in this section. Alarm and/or event displays shall also be provided and proven functional prior to acceptance of the system. A means of capturing and printing of all graphic screens shall also be included. The software program provided must be capable of printing the screen in a black and white (using gray scale) or color format. This program must be accessible from all terminals provided under this contract. The black and white printing shall be done in a manner in which the use of the black background is not represented in the printout. This is done to keep the utilization of ink cartridge and toner cartridge to a minimum.

2. All graphic screens shall be animated to indicate the current state of the piece of equipment. The following graphic screens shall be provided, as a minimum.

    a. Vertical Well Overview
    b. Graphic Screen for each Well Pump
    c. Alarm Summary Updates
    d. Event Summary Updates

D. Report Formats

1. Report formats shall be developed and programmed by the System Supplier using tag names defined in the database creation. Reports shall be provided as summarized below. All reports will be provided with a header on each page to indicate the contents of each column of information. Each page shall be numbered and indicate the name of the report, the date the report was printed, and the time of the printout. The printout shall also include the time span of the information shown on the report.

    a. Daily Operating Report. A daily report, listing the major plant variables (up to 25 variables) shall be provided. The report shall include hourly values and minimum/maximum/average values where appropriate. A minimum of 25 separate daily reports shall be provided by the System Supplier.
    b. Monthly Operating Report. A monthly operating report, which averages the values from the above daily reports, shall be provided. The report shall include monthly minimum/maximum/average values where appropriate.

E. Configuration Standards and Conventions

1. System Supplier and Contractor shall conduct a meeting with Owner and Engineer to review Owner’s current configuration and standards. System Supplier shall document the results of the meeting and submit for review by the Owner and Engineer.

F. Configuration Review Meetings

1. Proposed graphic screens and report formats shall be reviewed with the Owner and Engineer throughout the configuration process. The System Supplier's programming personnel shall attend all meetings. A second review meeting shall be held at approximately 50 percent completion. Both meetings shall be held at the Owner's facilities.

G. Software Functional Requirements

1. General functional requirements for system configuration are indicated on the Drawings and described in the specifications. The information presented herein and indicated on the Drawings illustrates the general functional intent of the system and may not be sufficient to fully configure the system. The System Supplier shall be responsible for determining what additional information may be required to complete the configuration tasks, and for obtaining this information from the Engineer or the Owner.

3.3 SYSTEMS CHECK

A. System Supplier shall provide the services of a trained and experienced field supervisor to assist the installation contractor during installation, and to calibrate, test, and advise others of the procedures for installation, adjustment, and operation.

B. Field Manager

1. System Supplier shall appoint a field services manager who shall be responsible for the coordination of all system check-out and startup activities, and who shall be immediately available to Engineer and Owner by phone or on site for the duration of this project.

C. Field Inspection at Delivery

1. The field supervisor shall inspect major equipment items within five working days of delivery, to assure that the equipment was not damaged during shipment and shall supervise or assist with unpacking, initial placement, and initial wiring of the system.

D. Field Calibration of Instruments

1. After each instrument has been installed, a technical representative of System Supplier shall calibrate each instrument and shall provide a written calibration report for each instrument, indicating the results and final settings. The adjustments of calibrated instruments shall be sealed or marked, insofar as possible, to discourage tampering. Instrument calibration shall be done before checkout of the system operation. A typical instrument calibration report is attached to the end of this section.

E. Field Inspection Prior to Start Up

1. After installation and wiring connections are complete, the field supervisor, with additional System Supplier's personnel shall verify that each external connection to the

system is correctly wired and field process components and devices are functioning as intended. A minimum of two working days shall be included for this task, but System Supplier shall be responsible for completing the following scope of work.

2. Analog Signals

   a. Analog input signals shall be simulated at the transmitting source, and verified to be received at the proper register address in the control system. Analog outputs shall be generated at the control system, and verified to be received with the correct polarity, at the respective receiving device.

3. Discrete Signals

   a. Discrete input and output signals shall be simulated and verified that they are received at the respective receiving device, and at the proper voltage.

4. Devices by Other Suppliers

   a. If interrelated devices furnished by other suppliers, under other contracts, or by Owner, such as valve actuators, motor controls, chemical feeders, and instruments, do not perform properly at the time of system checkout, the field supervisor shall use suitable test equipment to introduce simulated signals to and/or measure signals from these devices to locate the sources of trouble or malfunction.

5. System Check Out Report

   a. The System Supplier shall submit a written report on the results of such tests to Owner. Additional documentation shall be furnished as requested by Engineer to establish responsibility for corrective measures. System Supplier shall verify, in writing, to Owner that System Supplier has successfully completed the external connection check before beginning system startup or field acceptance testing.

F. Start Up Assistance

1. After the field supervisor has completed the system check and submitted his report, System Supplier shall supply a factory-trained programmer to provide on-site start up assistance. During the startup period, these personnel shall thoroughly check all equipment, correct any deficiencies, and verify the proper operation of all components. 5 working days shall be included for this task.

3.4 TESTING

A. The system shall be acceptance tested on site.

B. System Supplier shall prepare a testing procedure to be approved by Owner that shall demonstrate that the system conforms to the specifications. The testing procedure shall be submitted at least 30 days in advance of testing. The testing shall be conducted by System Supplier and witnessed by Owner and/or Engineer.

C. System Supplier shall notify Owner in writing at least 14 days before the proposed testing date. If the site acceptance test is concluded unsuccessfully, the test shall be repeated. System Supplier shall reimburse Owner for all expenses incurred in connection with attending repeated factory or site testing necessitated by system failure or inadequate preparation.

D. Site Acceptance Testing

1. After installation and checkout by System Supplier's personnel, the system shall be subjected to an acceptance test.

2. Site acceptance testing shall be scheduled after receipt of the System Check Out Report and System Supplier shall verify that all field signal changes are reflected in the proper address locations in the system database.

3. The site acceptance testing shall operate without loss of basic functions. The number of working days of continuous operation for the test shall be five. The operational demonstration shall confirm that the status, alarm, and process variable signals are valid and are being updated appropriately, and that the discrete and analog output signals from the control system are being correctly transmitted and implemented. Any errors or abnormal occurrences shall be recorded by System Supplier's field representative. System Supplier's field representative need not be continuously present during the site acceptance testing but shall be available to respond to the site within one hour of notification. The representative shall inspect the system for faults at least once every 24 hours and shall log or record any noted problems. The log shall include a description of the problem, its apparent cause, and any corrective action taken.

4. Failure of Redundant Equipment

a. Failure of redundant equipment shall not be considered downtime provided that automatic failover occurs as specified and, in the opinion of Owner, the failure was not caused by deficiency in design or installation. In the event of repeated failure of any hardware component or software module, the acceptance test shall be terminated and re-started.

5. Completion of Test

a. Successful completion of the site acceptance test, including the operational demonstration, is prerequisite to Substantial Completion as specified in the Supplementary Conditions.

E. Testing shall be conducted as a series of unwitnessed and witnessed tests which progressively demonstrate that the component subsystems as well as the overall Plant Control System at each facility conforms to the specifications. Testing shall involve the System Supplier, Contractor, Engineer, and/or Owner.

F. System Supplier shall prepare a testing procedure to be approved by Owner and/or Engineer that shall demonstrate that the system conforms to the specifications. The testing procedure shall be submitted at least 30 days in advance of testing. The testing shall be conducted by System Supplier and witnessed by Owner and/or Engineer.

G. System Supplier shall notify Owner and/or Engineer in writing at least 14 days before the proposed testing date. If the factory demonstration test is concluded unsuccessfully, the test shall be repeated. System Supplier shall reimburse Owner and/or Engineer for all expenses incurred in connection with attending repeated factory or site testing necessitated by system failure or inadequate preparation.

H. System Test Plan.

1. System Supplier shall prepare a System Test Plan to describe the overall process to be used for system testing. The plan shall provide an overview of each test activity, both unwitnessed and witnessed, as well as a preliminary schedule. The plan shall include a description of all test equipment, simulation hardware and software, and other devices which will be used to simulate field conditions and system loading for factory testing. Sample test procedures which illustrate the level of detail to be provided as part of the test procedures shall be included in the System Test Plan. The test plan shall also provide a preliminary description of planned phasing for field testing. The System Test Plan shall be submitted as part of the Stage 1 submittal package.

I. System Test Procedures.

1. Comprehensive Test Procedures shall be prepared. for the Site Demonstration Test (SDT). The test procedures shall contain detailed test sequences designed to demonstrate each system function defined by the specifications. Each test sequence shall contain the following information:

    a. Description of function to be demonstrated, including specification reference
    b. Description of hardware/software setup including any test equipment and/or simulation software to be used
    c. Description of approach to be used to demonstrate alarm and failure conditions and other abnormal process conditions during SDT
    d. Step-by-step description of test, including specific data points, values, etc. to be used
    e. Expected results for each test step along with space to record actual results
    f. Space to describe any errors or deficiencies witnessed during test sequence
    g. Signature blocks for Owner’s Representative and System Supplier

2. System Supplier shall submit Test Procedures for review and approval by the Owner and/or Engineer at least 60 days prior to the anticipated start of the associated test.

End of Section

INSTRUMENT NAME & SERVICE:		
BRAND & MODEL NO.:		
TAG OR LOOP NO.:		
INPUT/OUTPUT RANGE:		
INPUT	ACTUAL OUTPUT	DESIRED OUTPUT
PROPORTIONAL BAND:		
RESET:		
POSITION OF SWITCHES, JUMPERS, ETC.		
COMMENTS:		
DATE OF CALIBRATION: CALIBRATED BY:		
Black & Veatch	INSTRUMENT CALIBRATION REPORT	Figure 1-13500

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Schedule 13500A
Instrument Device Schedule

Legend/Description Sheet
Item. This is an arbitrary sequential number which is for reference only.
Type. This refers to the instrument type shown on the P&IDs.
Loop. This is the sequential number assigned to the instrument.
Tag. This is the ISA (or similar) alpha tag representing the function of the instrument.
Service Description. This is the description of the instrument service.
Device Type & Size. This is the instrument device type and should match the description as listed in the specification. Where appropriate, the size of the device (such as diameter of flowmeters) will be listed.
Output Type. This generally will be '4-20 mA' or "Dry Contact'. It could also be a serial output for smart devices (such as HART or FLD-BUS) but only if the serial output is the primary I/O interface.
Output Range. This is the calibrated range for analog devices or the trip point(s) for discrete devices.
Power Type. This will typically be either '2-wire' for loop powered devices or '4-wire' for 120 volt powered devices.
P&ID Drawing. This is the drawing number of the P&ID where the device is shown.
Specification. This column may include a cross reference to another specification section where applicable or to a note which provides additional information. Notes are appended to the end of the device schedule listings.
Remarks. This column may include additional instrument information such as "shipped loose".

Item	Type	Loop	Tag	Service Description	Device Type	Size	Output Type	Output Range	Power Type	P&ID Drawing	Specification	Remarks
1	PIT	200	PIT-200	WELL NO. 2R PRESSURE	PRESSURE TRANSMITTER		4-20 mA	0-100 PSI	2-WIRE	VW-I-601	13563	
2	LT	200	LIT-200	WELL NO. 2R LEVEL	SUBMERSIBLE LEVEL TRANSMITTER		4-20 mA	0-100 FT	2-WIRE	VW-I-601	13563	
3	FE	200	FE-200	WELL NO. 2R FLOW	MAGNETIC FLOWMETER ELEMENT	16"				VW-I-601	13562	
4	FET	200	FIT-200	WELL NO. 2R FLOW	MAGNETIC FLOWMETER TRANSMITTER		4-20 mA	0-5 MGD	4-WIRE	VW-I-601	13562	
5	LSH	100	LSH-100	WELL NO. 2R VAULT FLOODED	FIXED MOUNT FLOAT TYPE LEVEL SWITCH					VW-I-601	13563	
6	ZSC	101	ZSO101	WELL NO. 2R VALVE OPEN	VALVE OPEN LIMIT SWITCH					VW-I-601		PROVIDED WITH VALVE
7	ZSO	101	ZSC-101	WELL NO. 2R VALVE CLOSED	VALVE OPEN LIMIT SWITCH					VW-I-601		PROVIDED WITH VALVE
8	PIT	300	PIT-300	WELL NO. 3R PRESSURE	PRESSURE TRANSMITTER		4-20 mA	0-100 PSI	2-WIRE	VW-I-601	13563	
9	LT	300	LIT-300	WELL NO. 3R LEVEL	SUBMERSIBLE LEVEL TRANSMITTER		4-20 mA	0-100 FT	2-WIRE	VW-I-601	13563	
10	FE	300	FE-300	WELL NO. 3R FLOW	MAGNETIC FLOWMETER ELEMENT	12"				VW-I-601	13562	
11	FET	300	FIT-300	WELL NO. 3R FLOW	MAGNETIC FLOWMETER TRANSMITTER		4-20 mA	0-5 MGD	4-WIRE	VW-I-601	13562	
12	LSH	100	LSH-100	WELL NO. 3R VAULT FLOODED	FIXED MOUNT FLOAT TYPE LEVEL SWITCH					VW-I-601	13563	
13	ZSC	101	ZSO101	WELL NO. 3R VALVE OPEN	VALVE OPEN LIMIT SWITCH					VW-I-601		PROVIDED WITH VALVE
14	ZSO	101	ZSC-101	WELL NO. 3R VALVE CLOSED	VALVE OPEN LIMIT SWITCH					VW-I-601		PROVIDED WITH VALVE
15	PIT	400	PIT-400	WELL NO. 4R PRESSURE	PRESSURE TRANSMITTER		4-20 mA	0-100 PSI	2-WIRE	VW-I-602	13563	
16	LT	400	LIT-400	WELL NO. 4R LEVEL	SUBMERSIBLE LEVEL TRANSMITTER		4-20 mA	0-100 FT	2-WIRE	VW-I-602	13563	
17	FE	400	FE-400	WELL NO. 4R FLOW	MAGNETIC FLOWMETER ELEMENT	16"				VW-I-602	13562	
18	FET	400	FIT-400	WELL NO. 4R FLOW	MAGNETIC FLOWMETER TRANSMITTER		4-20 mA	0-5 MGD	4-WIRE	VW-I-602	13562	
19	LSH	100	LSH-100	WELL NO. 4R VAULT FLOODED	FIXED MOUNT FLOAT TYPE LEVEL SWITCH					VW-I-602	13563	
20	ZSC	101	ZSO101	WELL NO. 4R VALVE OPEN	VALVE OPEN LIMIT SWITCH					VW-I-602		PROVIDED WITH VALVE
21	ZSO	101	ZSC-101	WELL NO. 4R VALVE CLOSED	VALVE OPEN LIMIT SWITCH					VW-I-602		PROVIDED WITH VALVE
22	PIT	500	PIT-500	WELL NO. 5R PRESSURE	PRESSURE TRANSMITTER		4-20 mA	0-100 PSI	2-WIRE	VW-I-602	13563	
23	LT	500	LIT-500	WELL NO. 5R LEVEL	SUBMERSIBLE LEVEL TRANSMITTER		4-20 mA	0-100 FT	2-WIRE	VW-I-602	13563	
24	FE	500	FE-500	WELL NO. 5R FLOW	MAGNETIC FLOWMETER ELEMENT	16"				VW-I-602	13562	
25	FET	500	FIT-500	WELL NO. 5R FLOW	MAGNETIC FLOWMETER TRANSMITTER		4-20 mA	0-5 MGD	4-WIRE	VW-I-602	13562	
26	LSH	100	LSH-100	WELL NO. 5R VAULT FLOODED	FIXED MOUNT FLOAT TYPE LEVEL SWITCH					VW-I-602	13563	
27	ZSC	101	ZSO101	WELL NO. 5R VALVE OPEN	VALVE OPEN LIMIT SWITCH					VW-I-602		PROVIDED WITH VALVE
28	ZSO	101	ZSC-101	WELL NO. 5R VALVE CLOSED	VALVE OPEN LIMIT SWITCH					VW-I-602		PROVIDED WITH VALVE

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SECTION 13530 - PROGRAMMABLE LOGIC CONTROLLERS

PART 1 - GENERAL

1.1 SCOPE

A. This section covers programmable logic controllers (PLCs), including associated input/output hardware to control process equipment and serve as the interface to field devices. PLCs to be provided shall include the following:

1. A new Allen-Bradley CompactLogix 5069-L320ERP PLC (PLC-6) shall be installed at the Intake Pump Station walkway MCC.

B. Control System

1. The Instrumentation and Control System section shall apply to all equipment furnished under this section. Additional PLC software requirements are indicated in Software Control Block Descriptions section.

1.2 GENERAL

A. Equipment furnished and installed under this section shall be fabricated, assembled, erected, and placed in proper operating condition in full conformity with the Drawings, Specifications, engineering data, instructions, and recommendations of the equipment manufacturer, unless exceptions are noted by Engineer.

B. General Equipment Stipulations

1. The General Equipment Stipulations shall apply to all equipment and materials furnished under this section. If requirements in this specification differ from those in the General Equipment Stipulations, the requirements specified herein shall take precedence.

C. Drawings

1. Supplementing this section, the Drawings indicate the number and types of PLCs, locations of PLCs, and provide diagrams and schematics regarding connection and interaction with other equipment. All hardware, including power supplies, special cables, and other appurtenant equipment, shall be provided to meet the functional requirements described herein and indicated on the Drawings.

D. I/O List

1. An input/output (I/O) field device signal listing is included as an appendix attached to this section.

1.3 SUBMITTALS

A. See Section 13500 – Instrumentation and Control System

1. Submittals shall be as specified in the Instrumentation and Control System section.

1.4 DELIVERY, STORAGE, AND SHIPPING

A. Delivery, storage, and shipping shall be as specified in the Instrumentation and Control System Section.

1.5 SPARE PARTS

A. Spare parts shall be furnished as follows:

Spare Part	Quantity
Processor modules	1 of each type used
Power supply modules	1 of each type used
I/O Modules	1 of each type used

PART 2 - PRODUCTS

2.1 GENERAL

A. All equipment furnished under this section shall be expressly selected by System Supplier for its superior quality for the intended purpose and shall comply with the following requirements.

B. Interchangeability

1. All programmable logic controller systems shall be products of the same manufacturer and of the same series or product line. Processors, local and remote input/output hardware, communications modules, and specialty modules such as coprocessors and ASCII modules shall be interchangeable among all I/O panels and systems. PLC modules and hardware by other manufacturers will be acceptable only if the PLC manufacturer does not offer suitable modules and hardware for the same functions.

C. Initial, Spare, and Future Memory (RAM)

1. System Supplier shall provide adequate memory for the amount of I/O, control algorithms, and communications in the initial system.

2. Each programmable logic controller shall include provisions for future expansion and shall have 100 percent spare memory capacity and 100 percent spare data capacity installed. The spare memory capacity shall be documented by submitting to Engineer, during factory testing, a statement indicating the amounts of memory of all types being utilized and the

total amount available in each system. The statement shall include an estimate of the total program and data memory necessary, including spare memory, based on the I/O hardware for the system, and previous programming experience.

D. Spare I/O

1. Each PLC input/output enclosure shall be provided with at least 20 percent spare inputs and outputs of each type. Spare I/O shall be installed, wired, and interfaced properly to the terminal strip. In addition, each PLC input/output enclosure shall be capable of accommodating 20 percent of additional input/output capacity of each type as originally assembled

E. Expandability

1. Each PLC processor and associated I/O shall have a future expandability of at least 50 percent of the provided system.

F. Acceptable Manufacturers

1. The PLCs shall be Allen-Bradley CompactLogix series, without exception.

G. Signal Power Supplies

1. Regulated dc power supplies shall be provided in each PLC enclosure for analog inputs, digital outputs, and digital inputs. Power supplies shall be suitable for an input voltage variation of ±10 percent, and the supply output shall be fused or protected against short-circuiting.

2. The loop power supply shall be separate from the power supply circuit for the processor and racks.

3. The power source for all digital inputs from field devices shall be separately fused for each digital input module. Unless otherwise noted, all field devices will be provided with dry contacts that close to provide an input to the PLC.

H. Appurtenances

1. The PLC processor and I/O hardware shall be provided as complete systems, as shown on the control system block diagram drawings. The PLCs shall include all necessary hardware and software for a complete working system. All special rack or panel mounted power supplies, special interconnecting and programming cables, special grounding hardware, or isolation devices shall be furnished for proper operation of the equipment. Signal converters, signal boosters, amplifiers, special power supplies, special cable, special grounding, intrinsically safe relays and current repeaters, surge suppression devices, and isolation devices shall be furnished and installed for proper operation of the equipment.

I. PLC Arrangement

1. The PLCs shall be distributed and arranged as indicated on the Drawings.

J. Service Conditions

1. The PLC will be installed outdoors. PLC enclosure shall be furnished with sunshade.

2.2 SMALL PLC PROCESSOR

A. The programmable logic controller processor shall be an industrial type that utilizes nonvolatile type memory. Battery-backed memory is not acceptable.

B. Diagnostics

1. The processor shall utilize self-monitoring diagnostic techniques. Easily visible LEDs shall indicate "run" and "halt" status as well as memory and input/output error conditions. Diagnostic codes shall also be available through the programming device to facilitate troubleshooting.

C. Programming Port

1. The processor shall include a programming port that is available for programming and monitoring on-line after the system is fully functional. Removal or disruption of process control network communications, remote I/O communications, or HMIs to permit programming and monitoring will not be acceptable.

D. Communications

1. The processor shall be programmed to operate autonomously, regardless of communications status with other units.

E. Environment

1. The processor shall be suitable for operation in the environments specified in another section.

F. Programming

1. The processor shall be programmable using conventional relay ladder logic, or as required, and shall include the following functions and features.

   a. Contacts, coils, branching.
   b. Data comparisons.
   c. On-delay and off-delay timers.
   d. Counters with comparators.
   e. Floating Point Math and Logical instructions.
   f. Master control relay.
   g. Transitional or one-shot outputs.
   h. Standard and user-defined data tables for digital and analog value storage.

G. Capabilities

1. The processor shall include the following capabilities for programming, debug of programs, and troubleshooting.

   a. Off-line programming.
   b. On-line status of coils and registers.
   c. Input/output forcing.

H. Configuration

1. Processors shall be configured for standard rack mounting and shall be of plug-in printed circuit board construction. Each programmable logic controller shall include integral communications ports for the programming device, remote input/output, HMI device, or remote communications interfaces as required.

2. Programmable logic controller systems shall support the following types of input/output.

   a. 120 volt ac digital input and output.
   b. 4-20 mA dc analog input and output.

I. Input/Output Hardware

1. Input/output hardware shall be supplied in standard modules of 4, 8, 16, or 32 points each for assembly in local and remote input/output enclosures.

2. All input/output hardware shall be entirely contained within the PLC enclosure.

3. Programmable logic controllers having fixed, non-removable input/output hardware are not acceptable.

4. All digital input/output hardware shall include isolation against surges of at least 1500 volts. All output hardware connected to inductive loads shall be supplied with surge

suppression devices as required and recommended by the PLC manufacturer to prevent damage to output hardware. Combination input/output modules will be acceptable if they meet all of the requirements in the following subparagraphs.

5. Wiring Terminals

   a. All input/output modules shall utilize easily removable plug-in or hinged field wiring terminals to allow removal of modules without disconnecting individual wires.

6. I/O Circuit Power Supply

   a. Outputs for motor driven equipment will typically be powered from the driven equipment. Digital outputs for miscellaneous equipment shall be powered either from the controlled equipment or the PLC enclosure as indicated on the Drawings or as coordinated with the controlled equipment supplier. Outputs that control process equipment specified under other sections or provided under other contracts shall be fully isolated or shall operate relay-type digital output modules or interposing relays in the PLC cabinet.

7. Digital Input Modules

   a. Digital input modules shall sense voltages between 100 and 130 volts ac and shall have LED indicators for each point to display the status of the field contact. Each input module shall be suitable for being connected to a separate voltage source and return. Return voltage may be common to the entire input module. Digital input modules shall provide complete electrical isolation between individual inputs.

8. Digital Output Modules

   a. Digital output modules shall control voltages from 100 and 130volts acand shall be rated at least 1 ampere. Outputs shall be individually fused and shall have LED indicators to display output status. Each digital output shall be provided with an interposing relay. Outputs shall withstand a surge of at least 80 amperes for one cycle and shall have an off-state leakage current not to exceed 2.0 mA. **[**Digital input modules shall provide complete electrical isolation between individual inputs.**]**

9. Analog Input Modules

   a. Analog input modules shall accept linear 4-20 mA dc signals from field transmitters. Input circuitry shall be floating differential type designed to prevent loop grounding. Analog to digital conversion accuracy shall be at least 12 bit (0-4095 count) resolution. Where analog input signals are grounded outside of the PLC enclosure, isolation shall be provided for the associated analog input point either on the analog input module or through an I/I signal isolator provided in the PLC enclosure.

10. Analog Output Modules

a. Analog output modules shall transmit linear 4-20 mA dc signals to field devices. Loop power for all analog outputs shall be provided by regulated power supplies in each input/output enclosure and shall be capable of driving a 0 to 600 ohm load. Digital to analog conversion accuracy shall be at least 12 bit (0-4095 count) resolution.

11. Panel Terminations

a. All PLC input/output signals for field connections shall be terminated through panel enclosure terminal strips. Direct connection of field wiring to the I/O module terminals is not acceptable.

2.3 COMMUNICATIONS

A. Each programmable controller system shall be furnished complete with communication hardware modules for local input/output hardware, remote input/output hardware, other programmable controllers, or for host computers.

B. Communication hardware shall be compatible with the cable, data highway, fiber optic, or radio communication media.

C. Addressability

1. Each programmable logic controller shall be individually addressable so that only the selected controller responds when queried. Designation of a controller's process control network address shall be either software.

D. Communications Hardware

1. System Supplier shall provide all necessary communications hardware. Hardware shall be included for, but not be limited to, remote I/O, data highway, host computer, fiber optics, Ethernet, and radio.

2. PLC to PLC Communications Hardware

a. Each PLC shall communicate to other PLCs over a process control network as shown on the control system block diagram. System Supplier shall include all rack mounted, enclosure mounted, or desktop mounted communications modules required for a complete working system. Fiber optic transceivers shall be capable of Ethernet/IP communications over single mode fiber optic cable as indicated on the control system block diagram.

2.4 SYSTEM ENCLOSURES

A. Programmable logic controllers and input/output hardware shall be housed in existing or shop-assembled panels as indicated on the Drawings and as described in the Panels, Consoles, and Appurtenances section.

PART 3 - EXECUTION

3.1 INSTALLATION REQUIREMENTS

A. PLCs installation requirements are specified in Instrumentation and Control System section except as described herein.

B. Field check, testing, and training shall be as specified in the Instrumentation and Control System section.

3.2 CONFIGURATION

A. PLC Programming and Configuration

1. Configuration services are specified in the Instrumentation and Control System section.

B. Communications Configuration

1. Communications shall be configured as shown on the Drawings.

End of Section

Schedule 13530A
Input/Output List

Item. This is an arbitrary sequential number which is for reference only.
Type: This is the type of I/O signal, as follows:
AI = Analog Input
AO = Analog Output
DI = Discrete Input
DO = Discrete Output
Loop No. This is a sequential number for a given type within a specific controller.
Description. This is the description or the function (i.e. Filter 1 Loss-of-Head).
Field Device. This is the tag number of equipment identifier associated with the I/O point.
Controller ID. This is the panel identification for the I/O cabinet, PLC cabinet, or controller where the I/O signal terminates.
Analog Data (Signal Type). This will typically be 4-20mA, but could also be 1-5Vdc, serial, Network (Modbus TCP, MODBUS TCP/IP/IP), HART, BUS, or similar to indicate the signal type of the associated input or output.
Analog Data (Calibrated Range). This will be the scaled value of the input in engineering units.
Analog Data (Power). This will typically be '2-wire' for devices which are loop powered from the PLC enclosure, or '4-wire' for devices which are powered form external power supplies, unless noted otherwise.
Discrete Data (Signal Type). This will be 120VAC, 120VAC, or similar to indicate the signal type of the associated input or output.
Discrete Data (CLOSED State). This will indicate the state of the input or output when it is considered to be closed or energized (normal, alarm, running, failed, etc.).
Discrete Data (Power Source). This will indicate the location of the power source for the wetting voltage on the contacts, as follows:
Field = External field power source. (May require interposing relays or isolated I/O module type.)
PLC = Power originates from within the PLC or I/O enclosure.
Discrete Data (Interp Relay). This will be either 'Yes' or 'No' to indicate whether the input or output requires an interposing relay. Relays are typically required to isolate external voltage sources. See specifications for additional details.
P&ID Drawing. This is the P&ID drawing the I/O point can be found on.
Remarks. This column may include a cross reference to another specification section where applicable, or to a note which provides additional information. Notes are appended to the end of the I/O listing.

							Analog Data			Discrete Data					
Item	Type	IO Code	Loop No.	Description	Field Device	Controller ID	Signal Type	Calibrated Range	Power Type	Signal Type	CLOSED State	Power Source	Interp Relay	P&ID Drawing	Remarks
1	AI			FUTURE VERTICAL WELL NO. 1R LEVEL											
2	AI			FUTURE VERTICAL WELL NO. 1R FLOW											
3	AI			FUTURE VERTICAL WELL NO. 1R DISCHARGE PRESSURE											
4	AI			FUTURE VERTICAL WELL NO. 1R DISCH. VALVE POSTION											
5	AI	LI	200	VERTICAL WELL NO. 2R LEVEL	LI-200	PLC-6	4-20 mA	0-125 FEET	2-WIRE					VW-I-601	
6	AI	FI	200	VERTICAL WELL NO. 2R FLOW	FI-200	PLC-6	4-20 mA	0-5 MGD	4-WIRE					VW-I-601	
7	AI	PIT	200	VERTICAL WELL NO. 2R DISCHARGE PRESSURE	PIT-200	PLC-6	4-20 mA	0-100 PSI	2-WIRE					VW-I-601	
8	AI	ZI	201	VERTICAL WELL NO. 2R DISCH. VALVE POSTION	ZIT-201	PLC-6	4-20 mA	0-100%	4-WIRE					VW-I-601	
9	AI	LI	300	VERTICAL WELL NO. 3R LEVEL	LI-300	PLC-6	4-20 mA	0-125 FEET	2-WIRE					VW-I-601	
10	AI	FI	300	VERTICAL WELL NO. 3R FLOW	FI-300	PLC-6	4-20 mA	0-5 MGD	4-WIRE					VW-I-601	
11	AI	PIT	300	VERTICAL WELL NO. 3R DISCHARGE PRESSURE	PIT-300	PLC-6	4-20 mA	0-100 PSI	2-WIRE					VW-I-601	
12	AI	ZI	301	VERTICAL WELL NO. 3R DISCH. VALVE POSTION	ZIT-301	PLC-6	4-20 mA	0-100%	4-WIRE					VW-I-601	
13	AI	LI	400	VERTICAL WELL NO. 4R LEVEL	LI-400	PLC-6	4-20 mA	0-125 FEET	2-WIRE					VW-I-602	
14	AI	FI	400	VERTICAL WELL NO. 4R FLOW	FI-400	PLC-6	4-20 mA	0-5 MGD	4-WIRE					VW-I-602	
15	AI	PIT	400	VERTICAL WELL NO. 4R DISCHARGE PRESSURE	PIT-400	PLC-6	4-20 mA	0-100 PSI	2-WIRE					VW-I-602	
16	AI	ZI	401	VERTICAL WELL NO. 4R DISCH. VALVE POSTION	ZIT-401	PLC-6	4-20 mA	0-100%	4-WIRE					VW-I-602	
17	AI	LI	500	VERTICAL WELL NO. 5R LEVEL	LI-500	PLC-6	4-20 mA	0-125 FEET	2-WIRE					VW-I-602	
18	AI	FI	500	VERTICAL WELL NO. 5R FLOW	FI-500	PLC-6	4-20 mA	0-5 MGD	4-WIRE					VW-I-602	
19	AI	PIT	500	VERTICAL WELL NO. 5R DISCHARGE PRESSURE	PIT-500	PLC-6	4-20 mA	0-100 PSI	2-WIRE					VW-I-602	
20	AI	ZI	501	VERTICAL WELL NO. 5R DISCH. VALVE POSTION	ZIT-501	PLC-6	4-20 mA	0-100%	4-WIRE					VW-I-602	
21	AI			FUTURE VW-10-R LEVEL		PLC-6	4-20 mA	0-125 FEET	2-WIRE					N/A	
22	AI			FUTURE VW-10-R FLOW		PLC-6	4-20 mA	0-5 MGD	4-WIRE					N/A	
23	AI			FUTURE VW-10-R DISCHARGE PRESSURE		PLC-6	4-20 mA	0-100 PSI	2-WIRE					N/A	
24	AI			FUTURE VW10R-VLV-001 DISCH. VALVE POSITION		PLC-6	4-20 mA	0-100%	4-WIRE					N/A	
25	AI			FUTURE VW-11-R LEVEL		PLC-6	4-20 mA	0-125 FEET	2-WIRE					N/A	
26	AI			FUTURE VW-11-R FLOW		PLC-6	4-20 mA	0-5 MGD	4-WIRE					N/A	
27	AI			FUTURE VW-11-R DISCHARGE PRESSURE		PLC-6	4-20 mA	0-100 PSI	2-WIRE					N/A	
28	AI			FUTURE VW11R-VLV-001 DISCH. VALVE POSITION		PLC-6	4-20 mA	0-100%	4-WIRE					N/A	
29	DI			FUTURE VERTICAL WELL PUMP VW-1-R IN REMOTE											
30	DI			FUTURE VERTICAL WELL PUMP VW-1-R ON											
31	DI			FUTURE VERTICAL WELL PUMP VW-1-R TRIPPED											
32	DI			FUTURE VERTICAL WELL PUMP VW-1-R IN ALARM											
33	DI			FUTURE VERTICAL WELL NO. 1R VALVE VAULT HIGH WATER											
34	DI			FUTURE VW1R-VLV-001 OPENED											
35	DI			FUTURE VW1R-VLV-001 CLOSED											
36	DI			FUTURE VW1R-VLV-001 IN REMOTE											
37	DI	XI	200-1	VERTICAL WELL PUMP VW-2-R IN REMOTE		PLC-6				120 VAC	IN REMOTE	PLC		VW-I-601	
38	DI	XI	200-2	VERTICAL WELL PUMP VW-2-R ON		PLC-6				120 VAC	ON	PLC		VW-I-601	
39	DI	XA	200	FUTURE VERTICAL WELL PUMP VW-2-R TRIPPED		PLC-6				120 VAC	TRIPPED	PLC		VW-I-601	
40	DI	XA	200-1	FUTURE VERTICAL WELL PUMP VW-2-R IN ALARM		PLC-6				120 VAC	IN ALARM	PLC		VW-I-601	
41	DI	LSH	200	FUTURE VERTICAL WELL NO. 2R VALVE VAULT HIGH WATER		PLC-6				120 VAC	HIGH WATER	PLC		VW-I-601	
42	DI	ZIO	201	VW1R-VLV-002 OPENED		PLC-6				120 VAC	OPENED	PLC		VW-I-601	
43	DI	ZIC	201	VW1R-VLV-002 CLOSED		PLC-6				120 VAC	CLOSED	PLC		VW-I-601	
44	DI	YI	201	VW1R-VLV-002 IN REMOTE		PLC-6				120 VAC	IN REMOTE	PLC		VW-I-601	
45	DI	XI	300-1	VERTICAL WELL PUMP VW-3-R IN REMOTE		PLC-6				120 VAC	IN REMOTE	PLC		VW-I-601	

Schedule 13530A
Input/Output List

							Analog Data			Discrete Data					
Item	Type	IO Code	Loop No.	Description	Field Device	Controller ID	Signal Type	Calibrated Range	Power Type	Signal Type	CLOSED State	Power Source	Interp Relay	P&ID Drawing	Remarks
46	DI	XI	300-2	VERTICAL WELL PUMP VW-3-R ON		PLC-6				120 VAC	ON	PLC		VW-I-601	
47	DI	XA	300	VERTICAL WELL PUMP VW-3-R TRIPPED		PLC-6				120 VAC	TRIPPED	PLC		VW-I-601	
48	DI	XA	300-1	VERTICAL WELL PUMP VW-3-R IN ALARM		PLC-6				120 VAC	IN ALARM	PLC		VW-I-601	
49	DI	LSH	300	VERTICAL WELL PUMP VW-3-R VALVE VAULT HIGH WATER		PLC-6				120 VAC	HIGH WATER	PLC		VW-I-601	
50	DI	ZIO	301	VW1R-VLV-003 OPENED		PLC-6				120 VAC	OPENED	PLC		VW-I-601	
51	DI	ZIC	301	VW1R-VLV-003 CLOSED		PLC-6				120 VAC	CLOSED	PLC		VW-I-601	
52	DI	YI	301	VW1R-VLV-003 IN REMOTE		PLC-6				120 VAC	IN REMOTE	PLC		VW-I-601	
53	DI	XI	400-1	VERTICAL WELL PUMP VW-4-R IN REMOTE		PLC-6				120 VAC	IN REMOTE	PLC		VW-I-602	
54	DI	XI	400-2	VERTICAL WELL PUMP VW-4-R ON		PLC-6				120 VAC	ON	PLC		VW-I-602	
55	DI	XA	400	VERTICAL WELL PUMP VW-4-R TRIPPED		PLC-6				120 VAC	TRIPPED	PLC		VW-I-602	
56	DI	XA	400-1	VERTICAL WELL PUMP VW-4-R IN ALARM		PLC-6				120 VAC	IN ALARM	PLC		VW-I-602	
57	DI	LSH	400	VERTICAL WELL NO. 4R VALVE VAULT HIGH WATER		PLC-6				120 VAC	HIGH WATER	PLC		VW-I-602	
58	DI	ZIO	401	VW1R-VLV-004 OPENED		PLC-6				120 VAC	OPENED	PLC		VW-I-602	
59	DI	ZIC	401	VW1R-VLV-004 CLOSED		PLC-6				120 VAC	CLOSED	PLC		VW-I-602	
60	DI	YI	401	VW1R-VLV-004 IN REMOTE		PLC-6				120 VAC	IN REMOTE	PLC		VW-I-602	
61	DI	XI	500-1	VERTICAL WELL PUMP VW-5-R IN REMOTE		PLC-6				120 VAC	IN REMOTE	PLC		VW-I-602	
62	DI	XI	500-2	VERTICAL WELL PUMP VW-5-R ON		PLC-6				120 VAC	ON	PLC		VW-I-602	
63	DI	XA	500	VERTICAL WELL PUMP VW-5-R TRIPPED		PLC-6				120 VAC	TRIPPED	PLC		VW-I-602	
64	DI	XA	500-1	VERTICAL WELL PUMP VW-5-R IN ALARM		PLC-6				120 VAC	IN ALARM	PLC		VW-I-602	
65	DI	LSH	500	VERTICAL WELL PUMP VW-5-R VALVE VAULT HIGH WATER		PLC-6				120 VAC	HIGH WATER	PLC		VW-I-602	
66	DI	ZIO	501	VW1R-VLV-005 OPENED		PLC-6				120 VAC	OPENED	PLC		VW-I-602	
67	DI	ZIC	501	VW1R-VLV-005 CLOSED		PLC-6				120 VAC	CLOSED	PLC		VW-I-602	
68	DI	YI	501	VW1R-VLV-005 IN REMOTE		PLC-6				120 VAC	IN REMOTE	PLC		VW-I-602	
69	DI			FUTURE VW-10-R IN REMOTE		PLC-6				120 VAC	IN REMOTE	PLC		N/A	
70	DI			FUTURE VW-10-R ON		PLC-6				120 VAC	ON	PLC		N/A	
71	DI			FUTURE VW-10-R TRIPPED		PLC-6				120 VAC	TRIPPED	PLC		N/A	
72	DI			FUTURE VW-10-R IN ALARM		PLC-6				120 VAC	IN ALARM	PLC		N/A	
73	DI			FUTURE VW-10-R VALVE VAULT HIGH WATER		PLC-6				120 VAC	HIGH WATER	PLC		N/A	
74	DI			FUTURE VW10R-VLV-010 OPENED		PLC-6				120 VAC	OPENED	PLC		N/A	
75	DI			FUTURE VW10R-VLV-010 CLOSED		PLC-6				120 VAC	CLOSED	PLC		N/A	
76	DI			FUTURE VW10R-VLV-010 IN REMOTE		PLC-6				120 VAC	IN REMOTE	PLC		N/A	
77	DI			FUTURE VW-11-R IN REMOTE		PLC-6				120 VAC	IN REMOTE	PLC		N/A	
78	DI			FUTURE VW-11-R ON		PLC-6				120 VAC	ON	PLC		N/A	
79	DI			FUTURE VW-11-R TRIPPED		PLC-6				120 VAC	TRIPPED	PLC		N/A	
80	DI			FUTURE VW-11-R IN ALARM		PLC-6				120 VAC	IN ALARM	PLC		N/A	
81	DI			FUTURE VW-11-R VALVE VAULT HIGH WATER		PLC-6				120 VAC	HIGH WATER	PLC		N/A	
82	DI			FUTURE VW11R-VLV-010 OPENED		PLC-6				120 VAC	OPENED	PLC		N/A	
83	DI			FUTURE VW11R-VLV-010 CLOSED		PLC-6				120 VAC	CLOSED	PLC		N/A	
84	DI			FUTURE VW11R-VLV-010 IN REMOTE		PLC-6				120 VAC	IN REMOTE	PLC		N/A	
85	DO			FUTURE VERTICAL WELL PUMP VW-1-R RUN COMMAND											
86	DO			FUTURE VW1R-VLV-001 OPEN											
87	DO			FUTURE VW1R-VLV-001 CLOSE											
88	DO	UCR	200	VERTICAL WELL PUMP VW-2-R RUN COMMAND		PLC-6				120 VAC	RUN CMD	PLC	YES	VW-I-601	
89	DO	ZCO	201	VW2R-VLV-001 OPEN		PLC-6				120 VAC	OPEN	PLC	YES	VW-I-601	
90	DO	ZCC	201	VW2R-VLV-001 CLOSE		PLC-6				120 VAC	CLOSE	PLC	YES	VW-I-601	
91	DO	UCR	300	VERTICAL WELL PUMP VW-3-R RUN COMMAND		PLC-6				120 VAC	RUN CMD	PLC	YES	VW-I-601	
92	DO	ZCO	301	VW3R-VLV-001 OPEN		PLC-6				120 VAC	OPEN	PLC	YES	VW-I-601	
93	DO	ZCC	301	VW3R-VLV-001 CLOSE		PLC-6				120 VAC	CLOSE	PLC	YES	VW-I-601	
94	DO	UCR	400	VERTICAL WELL PUMP VW-4-R RUN COMMAND		PLC-6				120 VAC	RUN CMD	PLC	YES	VW-I-602	
95	DO	ZCO	401	VW4R-VLV-001 OPEN		PLC-6				120 VAC	OPEN	PLC	YES	VW-I-602	
96	DO	ZCC	401	VW4R-VLV-001 CLOSE		PLC-6				120 VAC	CLOSE	PLC	YES	VW-I-602	
97	DO	UCR	500	VERTICAL WELL PUMP VW-5-R RUN COMMAND		PLC-6				120 VAC	RUN CMD	PLC	YES	VW-I-602	
98	DO	ZCO	501	VW5R-VLV-001 OPEN		PLC-6				120 VAC	OPEN	PLC	YES	VW-I-602	
99	DO	ZCC	501	VW5R-VLV-001 CLOSE		PLC-6				120 VAC	CLOSE	PLC	YES	VW-I-602	
100	DO			FUTURE VW-10-R RUN COMMAND		PLC-6				120 VAC	RUN CMD	PLC	YES	N/A	
101	DO			FUTURE VW10R-VLV-001 OPEN		PLC-6				120 VAC	OPEN	PLC	YES	N/A	
102	DO			FUTURE VW10R-VLV-001 CLOSE		PLC-6				120 VAC	CLOSE	PLC	YES	N/A	
103	DO			FUTURE VW-11-R RUN COMMAND		PLC-6				120 VAC	RUN CMD	PLC	YES	N/A	
104	DO			FUTURE VW11R-VLV-001 OPEN		PLC-6				120 VAC	OPEN	PLC	YES	N/A	
105	DO			FUTURE VW11R-VLV-001 CLOSE		PLC-6				120 VAC	CLOSE	PLC	YES	N/A	

SECTION 13550 - SOFTWARE CONTROL BLOCK DESCRIPTIONS

PART 1 - GENERAL

1.1 SCOPE

A. This section provides functional descriptions of the PLC and computer software requirements for the Instrumentation and Control System as indicated on the Drawings. These descriptions are intended to provide an overview of the operating concept of the plant process equipment rather than describing in detail every operating feature or interlock. The System Supplier shall be responsible for programming the PLC and the Owner's SCADA system for all control functions listed.

B. Control System

1. The Instrumentation and Control System section shall apply to all systems described in this section.

1.2 SUBMITTALS

A. See the Instrumentation and Control System Section.

1. Submittals shall be as specified in the Instrumentation and Control System section.

PART 2 - PRODUCTS

2.1 GENERAL

A. The descriptions are applicable to the software specified in the Programmable Logic Controller section.

PART 3 - EXECUTION

3.1 PLC PROGRAMMING FUNCTIONAL REQUIREMENTS

A. The following paragraphs describe general configuration tasks that are required for the system PLC(s). These tasks shall be programmed in any applicable PLC. Each PLC may have multiple instances of each of these tasks or may have no instances of some or all of these tasks. The input/output lists (located in these documents as specified in the Instrumentation and Control System section) and detailed equipment control descriptions (included herein) shall be referenced to determine the requirements for each PLC.

B. The following paragraphs cover functional requirements of the software, which are generic and may or may not be related to any specific control loop.

C. Available Process Values

1. All PLC-generated process alarm, equipment status, and process variable values shall be available at any operator workstation.

D. Flow Values

1. Flow values shall be integrated, totalized, and stored in the PLC registers so the values displayed on the HMI computers and in the PLC processor will be identical.

E. System Failure

1. Failure of a PLC shall result in safe shutdown of associated process equipment. Interposing relays shall be provided where required to assure that equipment will revert to its fail-safe condition. Failure of any PLC or its communication shall be alarmed on the HMI computer.

F. HMI Computers

1. The HMI/SCADA computers shall function as a monitoring system, not as a controller, for the process equipment. The computer shall download set points and other information to the PLCs, and the PLCs shall perform all control algorithms, so a temporary failure of the any HMI computer will not disrupt plant control.

G. Rack/Module Configuration

1. The rack and module definitions for each PLC, as well as the PLC communications configuration shall be completely configured to allow proper addressing of all field connected I/O points. This shall include configuration of any remote input/output (RIO) racks.

H. PLC Database Definition

1. The PLC database will include both field I/O points and internally generated points required for programming. All field I/O points and internal programming points shall be fully defined according to database naming conventions approved by Owner. As a minimum, each database point shall be provided with a tag name, engineering unit, alarm parameters, and description.

I. Analog Scaling

1. Each analog input and output will be appropriately scaled for use in internal PLC programming, monitoring by the HMI computers, or transmission to other PLCs. Requirements for raw count values shall be coordinated with the operator interface software to ensure compatibility.

J. Equipment Runtimes

1. For each equipment item whose "run" status is monitored by a PLC, an internal equipment runtime shall be accumulated by the respective PLC. The runtime procedure will monitor the status of the equipment "run" contact and, when the equipment is running, increment a software timer that maintains equipment runtime to within a one-minute resolution. The timer shall stop incrementing, but not reset, when the "run" contact indicates that the equipment is not running. The timer value shall increment an hour counter that maintains an integer value representing the equipment run time in hours. The counter value shall be available for display on the HMI computer. A manual reset of the runtime value shall be available at the HMI computers for personnel at the supervisor level and above.

K. Change-of-State Alarms

1. While equipment is controllable from the PLC ("in remote"), discrete output commands shall be compared to their respective process feedback status signal (where available) to verify proper execution. If the feedback status does not match the most recent output command (after an adjustable 2 to 300 second time delay), an alarm message shall be displayed on the HMI computer and the condition shall be logged as an alarm, requiring operator acknowledgment. The alarm shall remain energized until the proper discrete condition is sensed or until the operator resets the alarm through the HMI computer.

L. Equipment Availability

1. In general, equipment with PLC control has been provided with a local selector switch that transfers control to the PLC. The PLC shall monitor the position of this switch to determine if the equipment is available for PLC control. If the equipment is not available, the PLC program shall not attempt to implement remote manual or automatic status changes for the equipment. The PLC program may, however, need to implement special routines if equipment unavailability affects a sequence (as described in the detailed equipment descriptions).

M. Maintained/Momentary Outputs

1. The need for maintained or momentary control outputs shall be determined from the input/output listing and the electrical schematics. In general, equipment with only one control output indicated in the I/O list shall be programmed for a maintained control output. Equipment with two (or more) control outputs shall be programmed for momentary outputs. Provisions shall be made, in either case, to remove the active state (start, open, forward, initiate, etc.) control output when an equipment failure is sensed or when the equipment transitions from available to unavailable (local switch change).

N. Equipment Mode Changes

1. Unless otherwise indicated in the equipment control descriptions, equipment in automatic mode shall be transitioned to manual mode (and stopped) if the equipment fails or becomes unavailable or if the PLC processor resets.

O. Manual/Auto Bumpless Transfer

1. Unless otherwise indicated in the equipment control descriptions, equipment changes from automatic to manual control shall be bumpless. Equipment running or stopped in automatic mode shall remain running or stopped when manual mode is selected.

3.2 DETAILED EQUIPMENT CONTROL DESCRIPTIONS.

A. The following paragraphs describe specific function requirements for various software control blocks in the control system. These descriptions are intended to provide an overview of the operational concept for the facilities, rather than describing in detail every operating feature or interlock.

1. Loop Description Title: Vertical Well Pumps

Associated Equipment:
Well Pump and Associated Instrumentation:
Well Pump 2R, LT-200, PIT-200, FIT-200, LSH-200
Well Pump 3R, LT-300, PIT-300, FIT-300, LSH-300
Well Pump 4R, LT-400, PIT-400, FIT-400, LSH-400
Well Pump 5R, LT-500, PIT-500, FIT-500, LSH-500

Associated PLC:
PLC-6

Associated Control Panels:
PLC-6 Control Panel
Well Pump Starter
Well Valve Actuator
Well Level Panel

Associated P&ID(s):
VW-I-601, VW-I-602

In all control modes, the pump shall be prevented from operation upon starter fault, pump fault, motor overload, motor leak detection, and high motor temperature.

Local Manual Mode:

Local manual control of the pump shall be provided at the starter when the LOCAL-OFF-REMOTE (L-O-R) selector switch is in the LOCAL position. The operator shall control the pump using the START and STOP pushbuttons.

Local Auto Mode:

None.

Remote Manual Mode:

Remote manual control of the pump shall be provided through the PLC and SCADA, when the L-O-R switch at the starter is in the REMOTE position and MANUAL control is selected at the HMI. The Operator shall manually control the pump using the START and STOP commands at the HMI.

After the pump is started, the operator will monitor the discharge pressure. Once the discharge pressure is sufficient, the operator shall have "Open-Modulating-Close" selections from SCADA. Open shall cause the valve to be fully opened. Close shall cause the valve to be fully closed. Modulating shall allow the operator to send a position setpoint to the valve. The PLC shall use the Valve Open and Valve Close outputs to position the valve to the position setpoint. A +/- 5% deadband shall be used to keep the valve from modulating excessively.

To shut down the pump, the operator shall select the Close signal to close the valve completely. The operator shall monitor the position of the valve and shall shut down the pump once it's closed.

A low-level alarm shall be generated when the level in the well reaches an Operator adjustable low level set point, as measured by the associated level transmitter, LT-100 through LT-500. In all control modes, a low discharge flow alarm shall be generated when the well is on and the discharge flow decreases to an Operator adjustable low flow set point, as measured by associated flow meter.

Remote Auto Mode:

In Remote Auto mode, the operator shall start and stop the pump manually. When Pump Start is selected, the pump shall be called to start. On starting, the discharge valve shall be automatically opened once the pump discharge pressure exceeds an operator-entered setpoint (initially set at 30 psi). On opening, the valve shall be positioned to maintain an operator-entered flow setpoint. A deadband of +/- 0.25 mgd shall be used to keep the valve from modulating excessively.

When an operator selects Pump Stop, the discharge valve shall be called to be fully closed. When the valve reaches 5% open (as measured by the valve position signal) or fully closed (based on the valve discrete signal), the pump shall be called to stop.

Power Failure:

On loss of utility or backup power, the PLC shall fully stop the pump. Upon restoration of utility power or backup power, the PLC shall resume the mode of control established prior to loss of power.

Alarms:

The PCS shall indicate the following alarms at a minimum:

- Pump Failure
- Motor Overload
- Motor High Temperature

- Moisture in Motor
- Starter Fault
- Low Well Level
- High Water in Vault Level

Status Indications:

The PCS shall indicate the following statuses at a minimum:

- Well Level
- Well Discharge Pressure
- Pump In Remote
- Pump Discharge Flow
- Pump In Local
- Pump On

Setpoints:

The PCS shall include the following setpoints at a minimum:

- Well Low Level (0 – 500 ft range, variable for each well)
- Low Pump Discharge Flow (0 – 750 gph range, initially 300 gph)
- Pump Discharge Pressure

Trending:

The following events shall be logged in the PCS at a minimum:

- Pump Discharge Valve Position
- Well Level
- Pump Discharge Flow
- Pump Discharge Pressure

HMI Requirements:

The Well Pump and all associated instrumentation and equipment shall be depicted on the corresponding process screen. Displays shall be similar to the P&ID. The pump shall be a selectable target which retrieves the respective overlay display. The overlay display shall contain control targets which allow selection of pump control mode (Remote Auto/Remote Manual, Flow mode) and all associated set points described herein.

2. Loop Description Title: Vertical Well Pump Valves

Associated Equipment:
Well Pump Discharge Valve:
VW2R-VLV-001
VW3R-VLV-001

VW4R-VLV-001
VW5R-VLV-001

Associated PLC:
PLC-6

Associated Control Panels:
PLC-6 Control Panel
Well Valve Actuator

Associated P&ID(s):
VW-I-601, VW-I-602

Local Manual Mode:

Local manual control of the valve shall be provided at the actuator when the LOCAL-REMOTE (L-R) selector switch is in the LOCAL position. The operator shall control the valve using the Open-Stop-Close selector switch.

Local Auto Mode:

None.

Remote Manual Mode:

Remote manual control of the valve shall be provided through the PLC and SCADA, when the L-O-R switch at the actuator is in the REMOTE position and MANUAL pump control is selected at SCADA. (SCADA Manual/Auto mode shall be selected for the pump/valve together, not independently.) The Operator shall manually operate the valve using the OPEN and CLOSE commands at SCADA as described in the "Vertical Well Pumps" section.

Remote Auto Mode:

Remote auto control of the valve shall be provided through the PLC and SCADA, when the L-O-R switch at the actuator is in the REMOTE position and AUTO pump control is selected at SCADA. The valve shall be controlled as described in the "Vertical Well Pumps" section.

Power Failure:

None.

Alarms:

The PCS shall indicate the following alarms at a minimum:

- Valve Fail to Open
- Valve Fail to Close

Status Indications:

The PCS shall indicate the following statuses at a minimum:

- Valve Open
- Valve Closed

Setpoints:

None

HMI Requirements:

The Well Pump and all associated instrumentation and equipment shall be depicted on the corresponding process screen. Displays shall be provided similar to the P&ID. The pump shall be a selectable target which retrieves the respective overlay display. The overlay display shall contain control targets which allow selection of pump control mode (Remote Auto/Remote Manual, Flow mode) and all associated set points described herein.

End of Section

SECTION 13561 - PANEL MOUNTED INSTRUMENTS

PART 1 - GENERAL

1.1 SCOPE

A. The Panel Mounted Instruments section covers the furnishing of all panel mounted instruments and accessories required for the Plant Control System as specified herein or as indicated on the Drawings.

B. Equipment and services provided under this section shall be subject to the Instrumentation and Control System section. This section shall be used and referenced only in conjunction with the Instrumentation and Control System section. Supplementing the Instrumentation and Control System section, instrument data, special requirements, and options are indicated on the Drawings or the Instrument Device Schedule.

C. When multiple instruments of a particular type are specified, and each requires different features, the required features are described on the Drawings or the Instrument Device Schedule.

1.2 DESIGN CRITERIA

A. The instruments shall be installed to measure, monitor, or display the specified process at the ranges and service conditions indicated on the Drawings or as indicated in the Instrument Device Schedule. The instruments shall be installed at the locations indicated on the Drawings or the Instrument Device Schedule.

B. Where possible, each instrument shall be factory calibrated to the calibration ranges indicated on the Drawings or in the Instrument Device Schedule. Transmitters or similar measurement instruments shall be calibrated using National Institute of Standards and Technology (NIST) approved bench calibration procedures, when such procedures exist for the instrument type. For "smart" devices, calibration data shall be stored digitally in each device, including the instrument tag designation indicated on the Drawings and/or Instrument Device Schedule.

C. Panel mounted instruments for each filter in a water plant, shall be supplied with power from a common source.

1.3 SUBMITTALS

A. See Section Instrumentation and Control System section.

1. Submittals shall be as specified in the Instrumentation and Control System section.

PART 2 - PRODUCTS

2.1 GENERAL

A. The following paragraphs describe minimum device stipulations. The Drawings or Instrument Device Schedule shall be used to determine any additional instrument options, requirements, or service conditions.

B. Programming Device

1. For systems that require a dedicated programming device for calibration, maintenance, or troubleshooting, one such programming device shall be provided for each Owner facility (quantity required shall be as indicated in the Instrumentation and Control System section). The programming device shall include appropriate operation manuals and shall be included in the training stipulations. For systems that allow the programming device functions to be implemented in software, running on a laptop computer, the software shall be provided instead of the programming device.

C. Configuration Software/Serial Interface

1. Devices indicated as requiring a serial interface shall be provided with all accessories to properly communicate over the serial link. An appropriate cable shall be provided to allow the transmitter serial interface to be connected to a laptop computer. One licensed copy of the diagnostic/interface software shall be provided for each Owner facility (quantity required shall be as indicated in the Instrumentation and Control System section). Software shall be capable of running under the Windows 10 operating system. If the software furnished performs the same functions as the programming device, specified elsewhere, then the programming device need not be furnished.

2.2 PANEL FRONT MOUNTED DEVICES.

A. Digital Panel Indicators

1. Digital indicators shall be designed for semi-flush mounting in a panel. The indicator shall be a 3-1/2 digit LED, LCD, or gas discharge type display, with digits at least 0.5 inch high. The indicator shall be easily read at a distance of 10 feet in varying control room lighting environments. Operating temperature range shall be 32°F to 140°F . Accuracy shall be ±0.1 percent. The indicator shall be scaled in engineering units, with the units engraved on the display face or on the associated nameplate. The indicator shall have a selectable decimal point and shall provide over-range indication. Digital indicators shall be manufactured by Schneider Electric/Eurotherm/Action Instruments, Omega Engineering, Inc./Newport Electronics, Precision Digital Corporation, or Red Lion Controls.

B. Switches, Lights, and Push Buttons.

1. Selector Switches

a. Selector switches shall be 30.5-mm, heavy-duty, oil-tight type with gloved-hand or wing lever operators. Position legends shall be engraved on the switch faceplate. Switches for electric circuits shall have silver butting or sliding contacts, rated 10 amperes continuous at 120 V ac. Contact configuration shall be as indicated on the Drawings or for the application. Switches used in electronic signal circuits shall have contacts suitable for that duty. Switches shall be Eaton/Cutler-Hammer "10250T", General Electric "CR104P", or Allen Bradley “800T”.

2. Indicating Lights

a. Indicating lights shall be 30.5-mm, heavy-duty, oil-tight type, with full voltage LED lamps. Legends shall be engraved on the lens or on a legend faceplate. Lights shall be push-to-test type. Indicating lights shall be Eaton/Cutler Hammer "10250T", General Electric "CR104P", or Allen Bradley “800T”.

3. Push Buttons

a. Push buttons shall be 30.5-mm, heavy-duty, oil-tight type. Legends shall be engraved on the push-button faceplate. Contacts shall be rated 10 amperes continuous at 120 V ac. Push buttons shall be Eaton/Cutler-Hammer "10250T", General Electric "CR104P", or Allen Bradley “800T”.

2.3 PANEL INTERIOR MOUNTED DEVICES

A. Power Supplies

1. Regulated dc power supplies for instrument loops shall be designed and arranged so that loss of one supply does not affect more than one instrument loop or system. Power supplies shall be suitable for an input voltage variation of ±10 percent, and the supply output shall be fused or shortcircuit protected. Output voltage regulation shall be by the instrumentation equipment supplied. Multiloop or multisystem power supplies will be acceptable if backup power supply units are provided which will automatically supply the load upon failure of the primary supply. The backup supply systems shall be designed so either the primary or the backup supply can be removed, repaired, and returned to service without disrupting the instrument system operation. Multiloop power supply connections shall be individually fused so a fault in one instrument loop will be isolated from the other loops being fed from the same supply. Fuses shall be clearly labeled and shall be located for easy access. Multiloop supply systems shall be oversized for an additional 10 percent future load. Failure of a multiloop supply shall be indicated on the respective instrument panel or enclosure.

2. Power supplies shall be Allen Bradley, Phoenix Contact, PULS, or equal.

3. Filter control systems may be designed so one power supply feeds all instrument loops common to one individual filter.

B. Relays

1. Relays indicated to be provided in panels, enclosures, or systems furnished under this section shall be of the plug-in socket base type with dustproof plastic enclosures unless noted otherwise. Relays shall be UL recognized and shall have not less than double-pole, double-throw contacts. Control circuit relays shall have silver cadmium oxide contacts rated 10 amperes at 120 V ac. Electronic switching-duty relays shall have gold-plated or gold alloy contacts suitable for use with low-level signals. Relays used for computer input, alarm input, or indicating light service shall have contacts rated at least 3 amperes. Time delay relays shall have dials or switch settings engraved in seconds and shall have timing repeatability of ±2 percent of setting. Latching and special purpose relays shall be for the specific application. Unless otherwise indicated, all relays shall have an integral pilot light that illuminates to indicate an energized condition. Relays shall be IDEC "Series RR"; Potter & Brumfield "Series KRP, CB"; or Struthers-Dunn "Series 219, 246".

C. Electronic Signal Booster/Isolators

1. Electronic signal boosters and isolators shall have all solid-state circuitry and complete electrical isolation between the power supply and the input and output signals. Accuracy shall be ±0.15 percent of span. Isolators shall be manufactured by Acromag, Moore Industries-International, Inc., or Phoenix Contact.

D. Strip Heaters

1. Electric strip heaters shall be provided as indicated on the Drawings, as specified, and for the application. Strip heaters shall be sized to prevent condensation within the enclosure and to maintain the equipment above its minimum operating temperature. Strip heaters shall be located to avoid overheating electronic hardware or producing large temperature fluctuations. Strip heaters shall be controlled by adjustable thermostats with adjustment ranges of 30° to 90°F . A circuit disconnect switch shall be provided within the enclosure.

PART 3 - EXECUTION

3.1 FIELD SERVICES

A. Manufacturer's field services shall be provided for installation, field calibration, startup, and training as specified in the Instrumentation and Control System section. Instruments shall not be shipped to the Work Site until two weeks prior to the scheduled installation. System Supplier shall be responsible for coordinating the installation schedule with the Installation Contractor. Each shipment shall contain a listing of protective measures required to maintain sensor operation, including a listing of any common construction or cleaning chemicals that may affect instrument operation.

End of Section

SECTION 13562 - FLOW INSTRUMENTS

PART 1 - GENERAL

1.1 SCOPE

A. The Flow Instrument Section covers the furnishing of flow instruments and accessories required for the Plant Control System as specified herein or as indicated on the Drawings.

B. Equipment and services provided under this section shall be subject to the Instrumentation and Control System section. This section shall be used and referenced only in conjunction with the Instrumentation and Control System section. Supplementing the Instrumentation and Control System section, instrument data, special requirements, and options are indicated on the Drawings or the Instrument Device Schedule.

C. When multiple instruments of a particular type are specified, and each requires different features, the required features are described on the Drawings or the Instrument Device Schedule.

1.2 DESIGN CRITERIA

A. Each device shall be a pre-assembled, packaged unit. Upon delivery to the work site, each device or system shall be ready for installation with only minor piping and electrical connections required by Contractor.

B. Primary elements shall derive any required power from the transmitter, unless otherwise indicated.

C. The instruments shall be installed to measure, monitor, or display the specified process at the ranges and service conditions indicated on the Drawings or as indicated in the Instrument Device Schedule. The instruments shall be installed at the locations indicated on the Drawings or in the Instrument Device Schedule.

D. Where possible, each instrument shall be factory wet flow calibrated to the full scale flow range of the sensors or calibration ranges indicated on the Drawings or in the Instrument Device Schedule. Transmitters or similar measurement instruments shall be calibrated using National Institute of Standards and Technology (NIST) approved bench calibration procedures, when such procedures exist for the instrument type. Calibration and configuration data shall be stored digitally in each device, including the instrument tag designation indicated on the Drawings or Instrument Device Schedule.

1.3 SUBMITTALS

A. See the Instrumentation and Control System Section.

1. Submittals shall be as specified in the Instrumentation and Control System section.

1.4 SHIPMENT, PROTECTION, AND STORAGE

A. Equipment provided under this section shall be shipped, protected, and stored as specified in the Instrumentation and Control System section. Identification of packaging shall be as specified in the Instrumentation and Control System section.

PART 2 - PRODUCTS

2.1 GENERAL

A. The following paragraphs provide minimum device requirements. The Drawings or Instrument Device Schedule shall be used to determine any additional instrument options, requirements, or service conditions.

B. Interconnecting Cable

1. For instruments where the primary element and transmitter are physically separated, interconnecting cable from the element to the transmitter shall be provided. The cable shall be the type approved by the instrument manufacturer for the intended purpose of interfacing the element to the transmitter. Length of cable shall be a minimum of three meters or as indicated on the Drawings or in the Instrument Device Schedule. The interconnecting cable shall be provided in the length necessary for installation. Splices shall not be allowed in the installed cable.

C. Programming Device

1. For instruments that require a dedicated programming device for calibration, maintenance, or troubleshooting, one such programming device shall be provided for each Owner facility (quantity required shall be as indicated in the Instrumentation and Control System section). The programming device shall include appropriate operation manuals and shall be included in the training requirements. For systems that allow the programming device functions to be implemented in software, running on a laptop computer, the software shall be provided instead of the programming device.

D. Configuration Software/Serial Interface

1. Devices indicated as requiring a serial interface shall be provided with all accessories required to properly communicate over the serial link. As a minimum, an appropriate cable shall be provided to allow the transmitter serial interface to be connected to a personal computer. One licensed copy of the diagnostic/interface software shall be provided for each Owner facility (quantity required shall be as indicated in the Instrumentation and Control System section). Software shall be capable of running under the Windows 11 operating system. If the software furnished performs the same functions as the programming device, specified elsewhere, then the programming device shall not be furnished.

2.2 FLOW INSTRUMENTATION.

A. Magnetic Flow Meters, Signal Converters, and Accessories.

1. Magnetic Flow Meter

a. The magnetic flow meter shall be a completely obstruction less, in-line flow meter with no constrictions in the flow of fluid through the meter. The meter shall consist of a metallic tube with flanged ends and with grounding rings or grounding electrodes as required by the application. Flange diameter and bolt drilling pattern shall comply with ANSI/ASME B16.5 for line sizes from 0.5 inches to 24 inches or AWWA C207 for line sizes larger than 24 inches. Flange class ratings and meter maximum pressure ratings shall be compatible with the adjoining piping. Flangeless wafer insert style meters may be used for pipe sizes up to 6 inches , where compatible with adjacent piping flanges. Self-cleaning electrodes shall be provided for all meters used for sludge metering. Electrode and liner materials shall be fully compatible with the process fluid as approved by the Engineer and shall comply with the requirements specified in the instrument device schedules. Each meter shall be factory wet flow calibrated to the sensors full flow capacity, at a facility, which is traceable to NIST or other standard acceptable to Engineer, and a copy of the calibration, report shall be submitted as part of the operation and maintenance manual submittal.

b. The meter shall be capable of standing empty for extended periods of time without damage to any components.

c. The meter housing shall be of a splash-proof and drip-proof design, unless indicated on the Drawings or in the Instrument Device Schedule to be submersible. Where required to be submersible, the meter housing shall withstand submergence in 30 feet of water for 48 hours without damage.

d. Meters shall be manufactured by Endress+Hauser, Foxboro, Krohne, Rosemount, or Siemens.

2. Magnetic Flow Meter Signal Converters

a. Separately mounted, microprocessor-based signal converters shall be provided for the magnetic flow meters. The signal converters shall include output damping, self-testing, built-in calibration capability, and an "empty pipe zero" contact input. The overall accuracy of the magnetic flow meter transmitter and signal converter shall be ±0.5 percent of actual flow rate for full-scale settings of 2 to 30 fps . The meter manufacturer shall furnish the signal cable between the converter and the magnetic flow meter. Signal cable shall be continuous and not spliced between the meter and the signal converter. The signal converter shall be housed in a corrosion resistant, weatherproof NEMA Type 4X housing and shall be suitable for operation over an ambient temperature range of -30 to +140°F , and relative humidity of 10 to 100 percent. The converter shall have an analog output of 4-20 mA dc. Transmitters tagged on the Drawings or specified to be of the indicating type shall contain a local indicator with a minimum four digit LCD type display, scaled to read in engineering units of flow.

b. Magnetic flow meter systems shall provide zero flow stability by means of automatic zero adjustment of a DC excited metering circuit. Converters shall be capable of bi-

directional flow measurement. Signal converters shall be of the same brand as the magnetic flow meters.

c. Where indicated on the Drawings or in the Instrument Device Schedule, the signal converter shall have a non-reset seven-digit totalizer on the face of the enclosure.

d. The signal converter shall be diagnosed and recalibrated with the use of a hand-held communicator/calibrator device. One device shall be furnished for all converters provided by a single manufacturer.

PART 3 - EXECUTION

3.1 FIELD SERVICES

A. Manufacturer's field services shall be provided for installation, field calibration, startup, and training as specified in the Instrumentation and Control System section.

B. Instruments shall not be shipped to the Work Site until two weeks prior to the scheduled installation. The System Supplier shall be responsible for coordinating the installation schedule with the Installation Contractor. Each shipment shall contain a listing of protective measures required to maintain sensor operation, including a listing of any common construction or cleaning chemicals that may affect instrument operation.

End of Section

SECTION 13563 - LEVEL INSTRUMENTS

PART 1 - GENERAL

1.1 SCOPE

A. This section covers the furnishing of pressure and level instruments and accessories required for the Plant Control System as specified herein or as indicated on the Drawings.

B. Equipment and services provided under this section shall be subject to the Instrumentation and Control System section. This section shall be used and referenced only in conjunction with the Instrumentation and Control System section. Supplementing the Instrumentation and Control System section, instrument data, special requirements, and options are indicated on the Drawings or the Instrument Device Schedule.

C. When multiple instruments of a particular type are specified, and each requires different features, the required features are described on the Drawings or the Instrument Device Schedule.

1.2 DESIGN CRITERIA

A. Each device shall be a pre-assembled, packaged unit. Upon delivery to the work site, each device or system shall be ready for installation with only minor piping and electrical connections required by Contractor.

B. Primary elements shall derive any required power from the transmitter, unless otherwise indicated.

C. No level or pressure instrumentation shall use mercury in switches or any other internal components.

D. The instruments shall be installed to measure, monitor, or display the specified process at the ranges and service conditions indicated on the Drawings or as indicated in the Instrument Device Schedule. The instruments shall be installed at the locations indicated on the Drawings or in the Instrument Device Schedule.

E. Where possible, each instrument shall be factory calibrated to the calibration ranges indicated in the Drawings or in the Instrument Device Schedule. Transmitters or similar measurement instruments shall be calibrated using National Institute of Standards and Technology (NIST) approved bench calibration procedures, when such procedures exist for the instrument type. Calibration data shall be stored digitally in each device, including the instrument tag designation indicated on the Drawings and/or Instrument Device Schedule.

1.3 SUBMITTALS

A. See Instrumentation and Control System section.

1. Submittals shall be as specified in the Instrumentation and Control System section.

1.4 SHIPMENT, PROTECTION, AND STORAGE

A. Equipment provided under this section shall be shipped, protected, and stored in accordance with the requirements of the Instrumentation and Control System section. Identification of packaging shall be as described in the Instrumentation and Control System section.

PART 2 - PRODUCTS

2.1 GENERAL

A. The following paragraphs provide minimum device stipulations. The Drawings or Instrument Device Schedule shall be used to determine any additional instrument options, requirements, or service conditions.

B. Interconnecting Cable

1. For systems where the primary element and transmitter are physically separated, interconnecting cable from the element to the transmitter shall be provided. The cable shall be the type approved by the instrument manufacturer for the intended purpose of interfacing the element to the transmitter. Length of cable shall be a minimum of three meters or as indicated in the Drawings or Instrument Device Schedule.

C. Programming Device

1. For systems that require a dedicated programming device for calibration, maintenance, or troubleshooting, one such programming device shall be provided for each Owner facility (quantity required shall be as indicated in the Instrumentation and Control System section.) The programming device shall include appropriate operation manuals and shall be included in the training requirements. For systems that allow the programming device functions to be implemented in software, running on a laptop computer, the software shall be provided instead of the programming device.

D. Configuration Software/Serial Interface

1. Devices indicated as requiring a serial interface shall be provided with all accessories required to properly communicate over the serial link. An appropriate cable shall be provided to allow the transmitter serial interface to be connected to a personal computer. One licensed copy of the diagnostic/interface software shall be provided for each Owner facility (quantity required shall be as indicated in the Instrumentation and Control System section). Software shall be capable of running under Microsoft's Windows 10 operating

system. If the software furnished performs the same functions as the programming device, specified elsewhere, then the programming device shall not be furnished.

2.2 PRESSURE AND LEVELINSTRUMENTATION.

A. Submersible Pressure Sensing Level Transmitters

1. The level transmitter system shall consist of a submersible pressure sensor/transmitter unit that is suitable for direct submersion into the liquid being measured. Sensor size shall not exceed 1-1/4 inch diameter by 9-inch length. The sensor shall be a solid-state variable capacitance or diffused silicon semiconductor type that shall provide an output signal directly proportional to the sensed pressure over a factory-calibrated range. The sensor assembly shall have a stainless steel or titanium housing and shall be supported by a polyethylene or urethane jacketed cable with a minimum 200 lb test strength. The sensor assembly shall include a protected flush diaphragm plate to allow placement of the sensor at the bottom of the well. The sensor cable shall be of sufficient length so that no splice or connector is required in the wet or inaccessible area, and the vent tube termination point is located in an area protected from dirt and moisture.

2. The transmitter shall have a two-wire type 4-20 mA dc current output that is proportional to level. The output shall have surge protection, and shall not be damaged by reverse polarity. The transmitter shall be suitable for an operating temperature range of 0° to +50°C. Accuracy of the level transmitter shall be ±0.25 percent "best straight line", with an overall combined accuracy of ±1 percent over the entire operating temperature/pressure range.

3. Submersible pressure sensing level transmitters shall be Ametek 575PB, or equal".

B. Pressure and Pressure Sensing Level Transmitters

1. Transmitters shall be an all solid state electronic two-wire device that does not require a direct power connection to the transmitter. Process fluid shall be isolated from the sensing elements by AISI Type 316 stainless steel, Hastelloy-C, ceramic, or cobalt-chromium-nickel alloy diaphragms, and the transducer may use a silicone oil fluid fill. Transmitters shall have self-diagnostics and electronically adjustable span, zero, and damping. Transmitters shall be enclosed in a NEMA Type 4X housing and shall be suitable for operation at temperatures from 0° to 180°F , and relative humidity of 5 to 100 percent. All parts shall be cadmium-plated carbon steel, stainless steel, duplex, or super duplex stainless steel, or other corrosion-resistant materials suitable for the medium they contact. Transmitters shall have over-range protection to maximum line pressure. Accuracy of the transmitter shall be 0.075 percent of span, and transmitter output shall be 4-20 mA dc without the need for external load adjustment. Transmitters shall not be damaged by reverse polarity. Transmitters shall have an elevated or suppressed zero. For calibrated spans of less than 8 psig, a differential pressure type transmitter with side vents shall be utilized. Transmitters shall be provided with brackets for wall and pipe-stand mounting.

2. Transmitters shall be factory calibrated to the required range and provided with the manufacturer's standard hand-held communications/calibration device. One device shall be furnished for all transmitters provided by a single manufacturer.

3. Transmitters tagged on the Drawings or specified to be indicating type shall be furnished with LCD type digital indicators.

4. Transmitters will have a turndown ratio of 30:1, or more.

5. Transmitters shall be ABB “Model 266HSH”, Endress+Hauser “Cerabar S”, or “Deltabar S Series”, Foxboro "Model IGP10S", or Rosemount “Model 2051”.

C. Flood Level Switches

1. The flood detecting level switches shall be float actuated and shall be suitable for wall bracket or sump mounting, as indicated on the Drawings or in the Instrument Device Schedule. The switch float mechanism shall actuate when the water level rises to 1 inch above the bottom of the housing. The switch contacts shall be hermetically sealed, rated for 0.1 amp [A] at 120 V ac, and shall be field changeable from normally open to normally closed. Flood switches shall be Contegra "Model FS 202".

PART 3 - EXECUTION

3.1 FIELD SERVICES

A. Manufacturer's field services shall be provided for installation, field calibration, startup, and training as specified in the Instrumentation and Control System section.

B. Instruments shall not be shipped to the Work Site until two weeks prior to the scheduled installation. System Supplier shall be responsible for coordinating the installation schedule with the Installation Contractor. Each shipment shall contain a listing of protective measures required to maintain sensor operation, including a listing of any common construction or cleaning chemicals that may affect instrument operation.

End of Section

SECTION 13570 - PANELS, CONSOLES, AND APPURTENANCES

PART 1 - GENERAL

1.1 SCOPE

A. The Panels, Consoles and Appurtenances section covers the furnishing of panels, consoles, and appurtenances as indicated on the Drawings.

B. This section also describes requirements for panels furnished under other sections whose respective specification refers to this section. Panels furnished under other sections are not listed in the attached Equipment Schedules.

1. A new PLC panel shall be provided in the Intake Pump Station walkway MCC control center.

C. Control System

1. The Instrumentation and Control System section shall apply to all equipment furnished under the Panels, Consoles and Appurtenances section.

1.2 GENERAL

A. Equipment furnished and installed under this section shall be fabricated and assembled in full conformity with the Drawings, specifications, equipment schedules, engineering data, instructions, and recommendations of the equipment manufacturer, unless exceptions are noted by Engineer.

1. General Equipment Stipulations

a. The General Equipment Stipulations shall apply to all equipment and materials provided under this section. If requirements in this specification differ from those in the General Equipment Stipulations, the requirements specified herein shall take precedence.

B. Seismic Design Requirements

1. Seismic design requirements for products specified herein shall be as indicated in the Meteorological and Seismic Design Criteria section.

C. Drawings

1. General dimensions and arrangements are indicated on the Drawings. System Supplier shall be responsible for coordinating the console and enclosure sizes and arrangements to accommodate the equipment provided.

1.3 SUBMITTALS

A. See Section 13500 – Instrumentation and Control System

1. Submittals shall be as specified in the Instrumentation and Control System section.

B. Meterolical and Seismic Compliance

1. Submit confirmation of compliance with the requirements of the Meteorological and Seismic Design Criteria section.

1.4 DELIVERY, STORAGE, AND SHIPPING

A. Delivery, storage and shipping shall be as per the Instrumentation and Control System section.

PART 2 - PRODUCTS.

2.1 PANEL DESIGN AND FABRICATION FEATURES

A. All panels furnished shall conform to the stipulations of NEMA ICS-6-1993 (R2001, R2006). Unless indicated otherwise on the Drawings, the following paragraphs describe general fabrication specifications for the PLC cabinets, instrument panels, consoles, enclosures, and subpanels.

B. Power Entrance

1. The power entrance to each panel shall be provided with a surge protection device. Refer to the Instrumentation and Controls section for surge suppression requirements.

C. Power Wiring

1. Power distribution wiring on the line side of panel fuses shall be minimum 12 AWG. Secondary power distribution wiring shall be minimum 14 AWG. Wiring for ac power distribution, dc power distribution, intrinsically safe, and control circuits shall have different colors and shall agree with the color-coding legend on System Supplier’s panel wiring diagrams. With the exception of electronic circuits, all interconnecting wiring and wiring to terminals for external connection shall be stranded copper, insulated for not less than 600 volts, with a moisture resistant and flame retardant covering rated for not less than 90°C.

D. Instrument and Control Wiring

1. All internal panel wiring shall be type MTW stranded copper wiring rated not less than 600 volts. Electronic analog circuits shall be twisted and shielded pairs rated not less than 300 volts. Analog circuits shall be separated from ac power circuits. Intrinsically safe circuits shall be physically separated from other circuits in accordance with applicable codes. Wires within the panel shall conform to the minimum size as shown in the table below.

Type	Minimum Wire Size	Color
AC Control	16 AWG	Red
DC Control	16 AWG	Blue
Analog Circuits	18 AWG Twisted Pair	Black/Red

2. All wiring shall be grouped or cabled and firmly supported inside the panel. Each individual wire in power, control, and instrumentation circuits shall be provided with identification markers at each point of termination. The wire markers shall be positioned to be readily visible for inspection and the identification numbers shall match the identification on the supplier's panel wiring drawings. Wiring shall be bundled in groups and bound with nylon cable ties or routed in Panduit or similar nonmetallic slotted ducts. Ducts shall be readily accessible within the panel, with removable covers, and with space equal to at least 40 percent of the depth of the duct remaining available for future use after completion of installation and field wiring. Sufficient space shall be provided between cable groups or ducts and terminal blocks for easy installation or removal of cables.

E. Terminal Blocks

1. Terminal blocks for external connections shall be suitable for 12 AWG wire and shall be rated 30 amperes at not less than 300 volts. Terminal blocks shall be fabricated complete with marking strip, covers, and pressure connectors. Terminals shall be labeled to agree with identification shown on the supplier's submittal drawings. A terminal shall be provided for each conductor of external circuits, plus one ground for each shielded cable. Not less than 8 inches of clearance shall be provided between the terminal strips and the base of vertical panels for conduit and wiring space. Not less than 25 percent spare terminals shall be provided. Each control loop or system shall be individually fused, and all fuses or circuit breakers shall be clearly labeled and located for easy maintenance.

F. Device Tag Numbering System

1. All devices shall be provided with permanent identification tags. The tag numbers shall agree with the Instrument Device Schedule and with the supplier's equipment drawings. All field-mounted transmitters and devices shall have stamped stainless steel identification tags. Panel, subpanel, and rack-mounted devices shall have laminated phenolic identification tags securely fastened to the device. Hand-lettered labels or tape labels will not be permitted.

a. Nameplates

1) Nameplates shall be provided on the face of the panel or on the individual device. Panel nameplates shall have legends and approximate dimensions as indicated on the Drawings and shall be made of laminated phenolic material having engraved letters approximately 3/16 inch high extending through the black face into the white layer. Nameplates shall be secured firmly to the panel. Panel face nameplates do not replace the requirement for device identification tags as specified under the Device Tag Numbering System paragraph.

b. Indicating Light Color Designations

1) Indicating lights are specified in the Panel Mounted Instruments section. Indicating lights shall be colored as shown in the following table unless indicated otherwise on the Drawings, in other specification sections, or in the instrument device schedule.

Color	Meaning
Red	Associated equipment or device is "running," "open," or is in an "unsafe" state or position
Green	Associated equipment or device is "stopped," "closed," or is in a "safe" state or position
Yellow or Amber	Associated equipment or device has "failed" or a process alarm condition is present or imminent.
White	All other conditions not defined above.

c. Painting

1) Interior and exterior surfaces of all carbon-steel panels shall be thoroughly cleaned and painted with rust inhibitive (universal) primer. The panel interior shall be painted white with the manufacturer's standard coating. All pits and blemishes in the exterior surface shall be filled. Exterior surfaces shall be painted with one or more finish coats of the manufacturer's standard coating. Finish coats shall have a dry film thickness of at least 4 mils . Color shall be ANSI 61 Gray. One quart of touch-up paint shall be furnished with the panels.

d. Panel-Mounted Instruments

1) Instruments, power supplies, pilot devices, and appurtenances mounted within or on the face of the panel shall meet the requirements specified in Section 13561, Panel Mounted Instruments, for those items unless noted otherwise herein, on the Drawings or, if applicable, within the referring equipment specification section.

e. Factory Test

1) Panels shall be factory tested electrically and pneumatically by the panel fabricator before shipment.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

A. Installation requirements are specified in the Instrumentation and Control System section. In addition, equipment furnished under this section shall conform to the following manufacturing stipulations.

1. Wiring

a. All wiring shall be grouped or cabled and firmly supported inside the panel. Wiring shall be bundled in groups and routed in Panduit or similar nonmetallic slotted ducts. Ducts shall be readily accessible within the panel with removable covers and shall have a space of at least 40 percent of the depth of the duct available for future use after installation is complete and all field wiring installed. Sufficient space shall be provided between cable groups or ducts and terminal blocks for easy installation or removal of cables.

2. More Than One Panel

a. Where signal or loop wiring must be routed to more than one panel or device, the required circuit routing shall be as indicated on the one-line diagrams. The panel fabricator shall provide such additional circuits as may be indicated on the electrical schematic Drawings.

End of Section

Equipment Schedule 13570-S01

WALL-MOUNTED CABINETS

1.000	**General**		
1.010	Specification Section 13570		
2.000	**Wall Mounted Cabinets**		
2.010	Tag Number/Panel ID	PLC-6 Panel	Vertical Wells Level Panel
2.020	NEMA Enclosure Rating		
	12		X
	3R		
	4		
	4X	X	
2.030	Materials of construction		
	Painted Carbon steel		X
	316 Stainless steel	X	
	Fiberglass polyester		
2.040	Environmental provisions		
	Sun shade	X	
	Cooling fan		
	Air conditioner		
2.050	Dimensions (min. L x W x H)	**42” x 24” x 36”**	**12” x 8” x 20”**
3.000	**Exceptions, Clarifications, and Comments**		
3.010	**None**		

SECTION 15010 - VALVE INSTALLATION

PART 1 - GENERAL

1.1 SCOPE

A. This section covers the installation of new valves and actuators purchased by Contractor as part of this Work

B. Cleaning, disinfection, pressure and leakage testing, insulation, and pipe supports are covered in other sections.

C. The following specification sections are applicable to valves to be installed:

1. Miscellaneous Ball Valves
2. AWWA Butterfly Valves
3. Check Valves
4. Air Valves
5. Miscellaneous Valves and Hydrants

1.2 GENERAL

A. Equipment installed under this section shall be erected and placed in proper operating condition in full conformity with Drawings, Specifications, engineering data, instructions, and recommendations of the equipment manufacturer, unless exceptions are noted by Engineer.

B. Coordination

1. When manufacturer's field services or installation check services are provided by the valve manufacturer, Contractor shall coordinate the services with the valve manufacturer. Contractor shall give Engineer written notice at least 30 days prior to the need for manufacturer's field services.

2. Flanged connections to valves including the bolts, nuts, and gaskets are covered in the appropriate pipe specification section. Valve ends shall match piping.

PART 2 - PRODUCTS

Not Applicable.

PART 3 - EXECUTION

3.1 INSPECTION

A. All valves and accessories shall be inspected for damage and cleanliness before being installed. Any material damaged or contaminated in handling on the job shall not be used unless it is repaired and re-cleaned to the original requirements by Contractor. Such material shall be segregated from the clean material and shall be inspected and approved by Owner or his representative before its use.

3.2 INSTALLATION

A. General

1. Valves shall be installed with sufficient clearance for proper operation of any external mechanisms, and with sufficient clearance to dismantle the valve for in-place maintenance. Installation shall be in accordance with the valve manufacturer's recommendations.

B. Installation Checks

1. When specified in the valve sections, the valve manufacturer will provide installation checks. For installation checks, the manufacturer's field representative will inspect the valve installation immediately following installation by Contractor. The manufacturer's representatives will revisit the site as often as necessary to ensure installation satisfactory to Owner.

C. AWWA Butterfly Valves

1. Butterfly valves shall be installed with the shaft horizontal unless otherwise necessary for proper operation or as acceptable to Engineer.

2. Whenever an actuator must be removed to permit installation of a valve, the actuator shall be promptly reinstalled and shall be inspected and readjusted by a representative of the valve manufacturer.

D. Check Valves

1. Swing Check Valves

a. Install valves oriented for the correct flow direction. Only valves designed for vertical installation shall be installed in vertical piping.

E. Plug Valves

1. Not used.

F. Resilient Seated Gate Valves

1. Not used

G. Air Release and Combination Air Valves

1. The exhaust from each valve shall be piped to a suitable point acceptable to Engineer.

H. Hydrants

1. Yard Hydrants

a. A concrete slab 18 inches square and 4 inches thick shall be provided around the top of each 3/4 inch and 1-1/2 inch yard hydrant. Hydrants shall be installed plumb. Hydrant drainage shall be provided by installing below each hydrant at least 1 cubic foot of gravel or crushed stone.

I. VALVE ACTUATORS

1. Valve actuators and accessories shall be factory mounted on the valve, calibrated, and tested by the valve or actuator manufacturer.

3.3 FIELD QUALITY CONTROL

A. Field Testing

1. After installation, all valves shall be tested in accordance with the Pipeline Pressure and Leakage Testing section.

2. Pressure Tests

a. Pressure testing shall be in accordance with the Pipeline Pressure and Leakage Testing section.

3. Leakage Tests

a. All valves shall be free from leaks. Each leak that is discovered within the correction period stipulated in the General Conditions shall be repaired by and at the expense of Contractor. This requirement applies whether pressure testing is required or not.

3.4 ADJUSTING

A. After installation, the opening and closing time shall be adjusted as needed for each pneumatic, hydraulic and electric actuated valve.

End of Section

SECTION 15020 - MISCELLANEOUS PIPING AND ACCESSORIES INSTALLATION

PART 1 - GENERAL

1.1 SCOPE

A. This section covers the installation of piping and accessories as indicated on the Drawings for the following piping sections:

1. Miscellaneous Plastic Pipe, Tubing, and Accessories

2. Copper Tubing and Accessories

B. Contractor shall furnish all necessary jointing materials, coatings, and accessories that are specified herein.

C. Pipe supports and anchors shall be furnished by Contractor, and are covered in the Pipe Supports section. Pipe trenching and backfilling are covered in the Trenching and Backfilling section.

1.2 GENERAL

A. Coordination

1. Materials installed under this section shall be installed in full conformity with Drawings, Specifications, engineering data, instructions, and recommendations of the manufacturer, unless exceptions are noted by Engineer.

1.3 SUBMITTALS

A. Drawings and Data

1. Complete specifications, data, and catalog cuts or drawings shall be submitted in accordance with the Submittals Procedures section. Items requiring submittals shall include, but not be limited to, the following:

a. Materials as specified herein.

1.4 QUALITY ASSURANCE

A. Tolerances

1. These tolerances apply to in-line items and connections for other lines.

2. The general dimension, such as face-to-face, face or end-to-end, face- or end-to center, and center-to-center shall be 1/8 inch .

3. The inclination of flange face from true in any direction shall not exceed 3/64 inch per foot .

4. Rotation of flange bolt holes shall not exceed 1/16 inch .

1.5 DELIVERY, STORAGE, AND HANDLING

A. Shipping shall be in accordance with the Product Delivery Requirements section. Handling and storage shall be in accordance with the Product Storage and Handling Requirements section. All materials shall be stored in a sheltered location above the ground, separated by type, and shall be supported to prevent sagging or bending.

B. Plastic pipe, tubing, and fittings shall be stored between 40°F and 90°F .

C. Coated Pipe

1. Handling methods and equipment used shall prevent damage to the protective coating and shall include the use of end hooks, padded calipers, and nylon or similar fabric slings with spreader bars. Bare cables, chains, or metal bars shall not be used. Coated pipe shall be stored off the ground on wide, padded skids. Plastic-coated pipe shall be covered or otherwise protected from exposure to sunlight.

PART 2 - PRODUCTS

2.1 SERVICE CONDITIONS

A. Pipe, tubing, and fittings covered herein shall be installed in the services indicated in the various pipe sections.

2.2 MATERIALS.

A. Threaded Fittings

1. Anti-Seize Thread Lubricant: Jet-Lube "Nikal," John Crane "Thread Gard Nickel," Never-Seez "Pure Nickel Special," or Permatex "Nickel Anti-Seize."

2. Teflon Thread Sealer: Paste type; Hercules "Real-tuff", John Crane "JC-30", or Permatex "Thread Sealant with Teflon."

3. Teflon Thread Tape: Hercules “Tape Dope” or John Crane “Thread Tape.”

B. Solvent Welded Fittings

1. Solvent Cement for PVC Systems: ASTM D2564.

2. Primer for PVC Systems: ASTM F656.

C. Insulating Fittings

1. Threaded: Dielectric steel pipe nipple, ASTM A53, Schedule 40, polypropylene-lined, zinc plated, Perfection Corp. "Clearflow Fittings."

2. Flanged: Epco "Dielectric Flange Unions" or Central Plastics "Insulating Flange Unions."

D. Pipe Insulation: See Mechanical Insulation section.

E. Watertight/Dusttight Pipe Sleeves: O-Z Electrical Manufacturing "Thruwall" and "Floor Seals," or Thunderline "Link Seals," with modular rubber sealing elements, nonmetallic pressure plates, and galvanized bolts.

1. Pipe Sleeve Sealant: Polysulfide or urethane, as specified in the Caulking section or as indicated in the Drawings.

F. Protective Coatings

1. Primer: As recommended by the tape manufacturer.

PART 3 - EXECUTION

3.1 INSPECTION

A. All piping components shall be inspected for damage and cleanliness before being installed. Any material damaged or contaminated in handling on the job shall not be used unless it is repaired and recleaned to the original requirements by Contractor. Such material shall be segregated from the clean material and shall be inspected and approved by Owner or his representative before its use.

3.2 PREPARATION

1. Field Measurement

a. Pipe shall be cut to measurements taken at the site, not from the Drawings. All necessary provisions shall be made in laying out piping to allow for expansion and contraction. Piping shall not obstruct openings or passageways. Pipes shall be held free of contact with building construction to avoid transmission of noise resulting from expansion.

3.3 INSTALLATION

A. General

1. All instruments and specialty items shall be installed according to the manufacturer's instructions and with sufficient clearance and access for ease of operation and maintenance.

2. Flat faced wrenches and vises shall be used for copper tubing systems. Pipe wrenches and vises with toothed jaws will damage copper materials and shall not be used. Bends in soft temper tubing shall be shaped with bending tools.

B. Pipe Sleeves

1. Piping passing through concrete shall be installed through sleeves that have been installed before the concrete is placed.

2. Unless otherwise indicated on the Drawings, all pipes passing through walls or slabs which have one side in contact with earth or exposed to the weather shall be sealed watertight with special rubber-gasketed sleeve and joint assemblies, or with sleeves and modular rubber sealing elements.

C. Pipe Joints

1. Pipe joints shall be carefully and neatly made in accordance with the indicated requirements.

2. Threaded

a. Pipe threads shall conform to ANSI/ASME B1.20.1, NPT, and shall be fully and cleanly cut with sharp dies. Not more than three threads at each pipe connection shall remain exposed after installation. Ends of pipe shall be reamed after threading and before assembly to remove all burrs. Unless otherwise indicated, threaded joints shall be made up with teflon thread tape, thread sealer, or a suitable joint compound.

b. Threaded joints in plastic piping shall be made up with teflon thread tape applied to all male threads. Threaded joints in stainless steel piping shall be made up with teflon thread sealer and teflon thread tape applied to all male threads. Threaded joints in steel piping for chlorine service shall be made up with teflon thread tape or litharge and glycerine paste applied to all male threads.

3. Compression

a. Ends of tubing shall be cut square and all burrs shall be removed. The tubing end shall be fully inserted into the compression fitting and the nut shall be tightened not less than 1-1/4 turns and not more than 1-1/2 turns past fingertight, or as recommended by the fitting manufacturer, to produce a leaktight, torque-free connection.

4. Flared

    a. Ends of annealed copper tubing shall be cut square, and all burrs shall be removed prior to flaring. Ends shall be uniformly flared without scratches or grooves. Fittings shall be tightened as needed to produce leaktight connections.

5. Soldered and Brazed

    a. Not used.

6. Solvent Welded

    a. Solvent welded connections shall only be used for PVC or CPVC pipe. All joint preparation, cutting, and jointing procedures shall comply with the pipe manufacturer's recommendations and ASTM D2855. Pipe ends shall be beveled or chamfered to the dimensions recommended by the manufacturer. Newly assembled joints shall be suitably blocked or restrained to prevent movement during the setting time recommended by the manufacturer. Pressure testing of solvent welded piping systems shall not be performed until the applicable curing time, as set forth in Table X2.1 of ASTM D2855, has elapsed. Solvent welding shall be performed by bonding operators who have met the requirements of ASME B31.3 and A328.

7. Epoxy and Adhesive Bonded

    a. Not used.

8. Heat Fusion Bonded

    a. Not used.

9. Flanged

    a. Flange bolts shall be tightened sufficiently to slightly compress the gasket and effect a seal, but shall not be torqued less than the minimum value required by the gasket manufacturer. Flange bolts shall not be so tight as to fracture or distort the flanges. A plain washer shall be installed under the head and nut of bolts connecting plastic pipe flanges. Anti-seize thread lubricant shall be applied to the threaded portion of all stainless steel bolts during assembly.
    b. Flange bolt holes shall be oriented as follows, unless otherwise indicated on the spool drawings:
        1) Vertical flange face: Bolt holes to straddle the vertical centerline.
        2) Horizontal flange face: Both holes shall be aligned with connecting pipe.

    c. Pipe sealants, thread compounds, or other coatings shall not be applied to flange gaskets unless recommended by the gasket manufacturer for the specified service and approved by Engineer.
    d. Welds at orifice flanges shall have internal surfaces ground smooth to the pipe wall.

e. Slip-on flanges shall be welded inside and outside. There shall be a distance of approximately 1/16 to 1/8 inch between the edge of the fillet weld and the face of the flange. The seal weld shall be applied so that the flange face shall be free of weld spatter and does not require refacing.

f. Flat-faced flanges shall be used when mating to Class 125 flanges. Full-face gaskets shall be used with flat-faced flanges and ring gaskets shall be used with raised faced flanges.

g. Weld neck flanges shall be used with butt-weld fittings. The bore of weld neck flanges shall match the pipe wall thickness.

h. Insulating joints connecting submerged (buried) piping to exposed piping shall be installed above the maximum water surface elevation and before the first pipe support not having coated anchor bolts or adhesive-bonded concrete anchors. All submerged (buried) metallic piping shall be isolated from the concrete reinforcement. Insulating flanges shall be tested for electrical isolation after installation and bolt-up but prior to introduction of conducting fluid.

10. Welded

a. Not used.

11. Grooved Couplings

a. Not used.

12. Push-on

a. Gasket installation and other jointing procedures shall be in accordance with the recommendations of the manufacturer. Each spigot end shall be suitably beveled to facilitate assembly. All joint surfaces shall be lubricated with a heavy vegetable soap solution immediately before the joint is completed. Lubricant shall be suitable for use in potable water, shall be stored in closed containers, and shall be kept clean.

13. Rubber-Gasketed

a. Not used.

14. Other Pipe Joints

a. Not used.

D. Pipe

1. Pipe shall be installed as specified, as indicated on the Drawings, or, in the absence of detail piping arrangement, in a manner acceptable to Engineer.

2. Piping shall be installed without springing or forcing the pipe in a manner which would induce stresses in the pipe, valves, or connecting equipment.

3. Piping shall be supported in conformance with the Pipe Supports section.

4. Piping shall be connected to equipment by flanges or unions as specified in the various piping sections. Piping connecting to equipment shall be supported by a pipe support and not by the equipment.

5. A union shall be provided within 2 feet of each threaded-end valve unless there are other connections which will permit easy removal of the valve. Unions shall also be provided in piping adjacent to devices or equipment which may require removal in the future and where required by the Drawings or the Specifications.

6. Stuffing box leakage from water sealed pumps shall be piped to the nearest point of drainage collection.

7. Taps for pressure gauge connections on the suction and discharge of pumping units shall be provided with a nipple and a ball type shutoff valve.

8. Drilling and tapping of pipe walls for installation of pressure gauges or switches will not be permitted.

9. In all piping, insulating fittings shall be provided to prevent contact of dissimilar metals, including but not limited to, contact of copper, brass, or bronze pipe, tubing, fittings, valves, or appurtenances, or stainless steel pipe, tubing, fittings, valves, or appurtenances with iron or steel pipe, fittings, valves, or appurtenances. Insulating fittings shall also be provided to prevent contact of copper, brass, or bronze pipe, tubing, fittings, valves or appurtenances with stainless steel pipe, tubing, fittings, valves, or appurtenances.

10. Piping adjacent to flow sensors shall be installed in accordance with the requirements of the manufacturer of the flow sensor and commonly accepted design practices of the appropriate straight pipe runs both upstream and downstream.

11. Drains required for operation are shown on the Drawings. However, vents at all high points and drains at all low points in the piping that are required for complete draining for pressure test may not be shown on these Drawings. Contractor shall add such items as found to be necessary during detail piping design and/or piping installation.

E. Valves

1. Isolation valves provided with equipment and instruments shall be located in a manner which will allow ease of access and removal of the items to be isolated. Prior to soldering or brazing valves, teflon and elastomer seats and seals shall be removed to prevent damage.

3.4 PIPING ASSEMBLY

A. <u>General</u>

1. Contractor shall only use labor that has been qualified by training and experience to capably perform the specified activities required to accomplish the work in a satisfactory manner

2. Any deviations from the Specifications or piping locations shown on the Drawings require prior review and approval by Engineer.

3.5 PRESSURE AND LEAKAGE TESTING

A. All specified tests shall be made by and at the expense of Contractor in the presence, and to the satisfaction of Engineer. Each piping system shall be tested for at least 1 hour with no loss of pressure. The Contractor shall coordinate this section with the Pipeline Pressure and Leakage Testing section. Piping shall be tested at the indicated pressures:

Service	Test Pressure	Test Medium
Water supply	1-1/2 times working pressure but not less than 225 psi	Water

B. Leakage may be determined by loss-of-pressure, soap solution, chemical indicator, or other positive and accurate method acceptable to Engineer. All fixtures, devices, or accessories which are to be connected to the lines and which would be damaged if subjected to the specified test pressure shall be disconnected and the ends of the branch lines plugged or capped as needed during the testing.

C. Unless otherwise required by the applicable codes, drainage and venting systems shall be air tested. For air testing, the system shall be charged with air to a minimum pressure of 5 psig . Openings shall be plugged as necessary for either type of test. To be considered free of leaks, the system shall hold the water or air for 30 minutes without any drop in the water level or air pressure.

D. All necessary testing equipment and materials, including tools, appliances and devices, shall be furnished and all tests shall be made by and at the expense of Contractor. Contractor shall give Engineer 5 working days advanced notice of scheduled testing.

E. All joints in piping shall be tight and free of leaks. All joints which are found to leak, by observation or during any specified test, shall be repaired, and the tests repeated.

3.6 CLEANING

A. The interior of all pipe, valves, and fittings shall be smooth, clean, and free of blisters, loose mill scale, sand, dirt, and other foreign matter when installed. Before being placed in service, the interior of all lines shall be thoroughly cleaned, to the satisfaction of Engineer.

3.7 ACCEPTANCE

A. Owner reserves the right to have any section of the piping system which he suspects may be faulty cut out of the system by Contractor for inspection and testing. Should the joint prove to be sound, Owner will reimburse Contractor on a time-and-material basis as specified in the Contract. Should the joint prove to be faulty, the destructive test will continue joint by joint in all directions until sound joints are found. Costs for replacement of faulty work and/or materials shall be the responsibility of Contractor.

End of Section

SECTION 15061 - DUCTILE IRON PIPE

PART 1 - GENERAL

1.1 SCOPE

A. This section covers the furnishing and installation of ductile iron pipe. Ductile iron pipe shall be furnished complete with all fittings, specials, adapters, closure pieces, blowoffs, outlets, caps and plugs, temporary bulkheads, access manholes, jointing materials, pipe hangers and supports, anchors, blocking, encasement, appurtenances, and accessories specified and indicated on the Drawings, and as required for proper installation and functioning of the piping.

B. Piping furnished hereunder shall be complete with all joint gaskets, bolts, nuts and other jointing materials required for installation of any valves and equipment furnished by Owner or others for installation under this Contract.

C. Pipe hangers and supports, pressure and leakage testing, and cleaning and disinfection are covered in other sections. Pipe trenching, embedment, and backfill are covered in the Trenching and Backfilling section.

1.2 GOVERNING STANDARDS

A. Except as modified or supplemented herein, all ductile iron pipe, fittings, and specials shall conform to the applicable requirements of the following standards and other standards named in this section:

ANSI/AWWA Standards	Title
C151	Ductile-Iron Pipe, Centrifugally Cast, For Water
C600	Installation of Ductile Iron Water Mains and Their Appurtenances
M41	Ductile Iron Pipe and Fittings - Manual of Water Supply Practices
C104	Cement Mortar Lining for Ductile Iron Pipe and Fittings
C105	Polyethylene Encasement for Ductile Iron Pipe Systems
C110	Ductile-Iron and Gray-Iron Fittings
C111	Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
C115	Flanged Ductile-Iron Pipe With Ductile-Iron or Gray-Iron Threaded Flanges

ANSI/AWWA Standards	Title
C153	Ductile-Iron Compact Fittings

1.3 SUBMITTALS

A. General Submittals.

1. Drawings, details, specifications, and installation schedules covering all ductile iron pipe and accessories shall be submitted in accordance with the Submittals Procedures section. The drawings and data shall include, but shall not be limited to, the submittals listed in this section.

B. ANSI/AWWA Certification

1. Certification by manufacturer (affidavit of compliance) for each item furnished in accordance with the ANSI/AWWA Standards.

C. Restrained joints details.

D. Gasket Certifications

1. Certification of gaskets by pipe manufacturer, certifying that gasket material is suitable for test pressures and services intended.

E. ANSI/NSF 61 Certification.

1. Certification that all materials in contact with treated or potable water are ANSI/NSF 61 approved.

F. Certification of Joint Lubricant.

G. Joint Test Certification

1. Certification of proof-of-design tests for joints, including restrained joints.

H. Encasement Samples

1. Two samples of the polyethylene encasement, each sample clearly identified as required by the Governing Standards and test results from an independent third party laboratory of the requirements specified in ANSI/AWWA C105/A21.5.

I. Deflection Measurement

1. The method that the Contractor proposes to use for measuring deflection of pipe joints.

J. Other Data

1. Submittal data shall clearly indicate the country of origin of pipe, fittings, flanges, restraining devices, and accessories. When requested by Engineer, certified copies of physical and chemical test results as outlined in ANSI/AWWA C151/A21.51 shall be submitted for the materials to be provided.

1.4 SHIPPING, HANDLING, AND STORAGE

A. Shipping shall be in accordance with the Product Delivery Requirements section. Handling and storage shall be in accordance with the Product Storage and Handling Requirements section, and as specified herein.

B. Pipe, fittings, and accessories shall be handled in a manner that will ensure installation in sound, undamaged condition. Equipment, tools, and methods used in handling and installing pipe and fittings shall not damage the pipe and fittings. Hooks inserted in ends of pipe shall have broad, well-padded contact surfaces. Unpadded hooks, wire brushes or other abrasive tools shall not be permitted to come into contact with polyethylene lining if such lining is specified.

C. Contractor-furnished pipe and fittings in which the lining has been damaged shall be replaced by and at the expense of Contractor. With the concurrence of Engineer, small and readily accessible damaged areas may be repaired.

D. Contractor shall repair any damage to pipe coatings and linings before the pipe is installed.

PART 2 - PRODUCTS

2.1 PIPE CLASS

A. The class of ductile iron pipe shall be as indicated in the following paragraph. The specified class includes service allowance and casting allowance.

Pipe Size	ANSI/AWWA Thickness Class
inches	
54 thru 16	54
12 and smaller	54

B. Pipe wall thickness for grooved and threaded end pipe shall be increased if necessary to comply with the following minimum thickness:

Pipe Size		Minimum Thickness Class	
inches		Threaded Ends (1)	Grooved Ends (2)
4-16		54	54
18	450	53	54
20	500	53	55
24	600	53	56
30-54	750-1400	53	--
60 and 64	1500-1600	350 (3)	--

(1) Complies with ANSI/AWWA C115/A21.15 for minimum pipe wall thickness for threaded flanges.

(2) Complies with ANSI/AWWA C606 for grooved and shouldered joint ductile iron pipe.

2.2 MATERIALS

Pipe	Ductile iron, ANSI/AWWA C151/A21.51
Gaskets – All Joint Types	Synthetic rubber unless otherwise specified; natural rubber will not be acceptable. All gaskets shall be furnished by the pipe manufacturer unless another manufacturer's product is indicated. Pipe manufacturer shall submit certificates of gasket suitability certifying that the gasket materials are compatible with the joints specified, are recommended for the specified field test pressure and service conditions. Gaskets for treated or potable water service shall be certified for chlorinated and chloraminated potable water. Gas and oil-resistant gaskets shall be made of Nitrile (NBR [Acrylonitrile Butadiene]) rubber. The name of the material shall be permanently marked or molded on the gasket. Gaskets shall also be certified as suitable where soils may be contaminated with gas and oil products.
Joint Lubricant	Vegetable-based lubricant recommended by the pipe manufacturer. Petroleum or animal-based lubricants will not be acceptable. Lubricants that will be in contact with treated or potable water shall be certified as being in compliance with ANSI/NSF 61.
Fittings	ANSI/AWWA C110/A21.10 (except shorter laying lengths will be acceptable for U.S. Pipe), or ANSI/AWWA C153/A21.53, minimum working pressure rating as follows, unless indicated otherwise on the Drawings.

Fitting Size, inches	Material	Type	Min. Working Pressure Rating, psi

4 to 24	DI	Mechanical and Push-on joints	350
4 to 24	DI	Flanged joints	250
30 to 48	DI	All joints	250
54 to 64	DI	All joints	150

All fittings shall be ductile iron and suitable for the rated working pressure plus a surge or test pressure allowance of 100 psi or 1.5 times rated working pressure, whichever is less, without leakage or damage.

Push-on Joints	ANSI/AWWA C111/A21.11
Restrained Push-on Joints, locking wedge type, 4 inch through 24 inch , working pressure rating 350 psi for 4 through 16 inch and at least 250 psi for 18 through 24 inch.	EBAA Iron "Megalug" Series 1700; U.S. Pipe “TR Flex Gripper Ring”; Star Pipe Products “StarGrip 3100P”; or American “Field Flex Ring”, without exception.
Restrained Push-on Joints, positive locking segments and/or rings, 4 inch through 64 inch , working pressure rating 350 psi .	American "Flex-Ring,"or “Lok-Ring”; Clow “Super-Lock”; U.S. Pipe or McWane "TR Flex."; or Griffin “Snap-Lok”.

Restrained push-on joints shall be suitable for a test or working pressure plus surge pressure of the rated working pressure plus 100 psi

Flanged Joints	ANSI/AWWA C115/A21.15
Flanges	Ductile iron, Class 125, ANSI/AWWA C115/A21.15.
Flanges	All flanges shall be suitable for test pressure of 1.5 times rated pressure without leakage or damage.
Bolts	ASTM A307, chamfered or rounded ends projecting 1/4 to 1/2 inch beyond outer face of nut.
Nuts	ASTM A563, hexagonal, ANSI/ASME B18.2.2, heavy semifinished pattern.
Gaskets	ASTM D1330, Grade I rubber, full face type, 1/8 inch thick unless otherwise required by pipe manufacturer and accepted by Engineer. Pipe manufacturer shall submit certification of gaskets furnished as indicated above under Gaskets - All Joint Types.
Insulated Flanges	

Flanges	As specified herein, except bolt holes shall be enlarged as needed to accept bolt insulating sleeves.
Insulation Kits	As manufactured by Advanced Products or Pipeline Seal and Insulator, Inc.
Insulating Gaskets	Type E, G-10, 1/8 inch thick, with Nitrile or EPDM sealing element for water and air service and Viton sealing elements for wastewater service unless otherwise required by pipe manufacturer and accepted by Engineer. Pipe manufacturer shall submit certification of gaskets furnished as indicated above under Gaskets - All Joint Types.
Bolt Insulating Sleeves	G-10, 1/32 inch thick.
Insulating Washers	G-10, 1/8 inch thick, two for each flange bolt.
Backing Washers	Steel, 1/8 inch thick, two for each flange bolt.
Mechanical Joints	ANSI/AWWA C111/A21.11, with ductile iron glands
Restrained Mechanical Joints (factory prepared spigot), 4 inch through 48 inch	American "MJ coupled Joints," or Griffin U.S. Pipe "Mech-Lok."
Restrained Mechanical Joints, (field cut spigot), 4 inch through 24 inch	EBAA Iron "Megalug" Series 1100, or Star Pipe Products “StarGrip 3000” without exception.
Wall Pipes or Castings	Mechanical joint with water stop and tapped holes; single casting or fabricated ductile iron pipe; holes sized in accordance with the details on the Drawings and provided with removable plugs.
Mechanical Joints with Tie Rods	As indicated in the Drawings.
Tie Rods	ASTM A276, Type 304 or Type 316 Stainless Steel.
Steel Pipe	ASTM A53, Schedule 40 or 80 as indicated on the Drawings.
Washers	ANSI/ASME B18.22.1, plain steel.
Threaded Connections	ANSI/ASME B1.20.1, NPT; with boss or tapping saddle wherever wall thickness minus the foundry tolerance at the tapped connection is less than that required for 4-thread engagement as set forth in Table A.1, Appendix A, of ANSI/AWWA C151/A21.51.

Mechanical Couplings	
Couplings	Dresser "Style 38"; Smith-Blair "441 or 411 Flexible Coupling"; without pipe stop.
Gaskets	Oil-resistant synthetic rubber gaskets shall be as recommended by the coupling manufacturer. Pipe manufacturer shall submit certification of gaskets furnished as indicated above under Gaskets - All Joint Types.
Restrained Mechanical Couplings	American Pipe “Restrained Coupling Gland Joint” coordinated with mechanical couplings furnished.
Flanged Coupling Adapters	Not acceptable.
Dismantling Joints	
Restrained 3 inch and larger Unless otherwise indicated on the Drawings, dismantling joints shall be restrained.	Romac "DJ400"; Dresser "Style 131 Dismantling Joint" or Viking Johnson. For use in potable water systems, coating to be in accordance with NSF-61.
Tapping Saddles	Not acceptable.
Watertight/Dusttight Pipe Sleeves	GPT " Link-Seal", insulating type with modular rubber sealing elements, nonmetallic pressure plates, and stainless steel bolts and nuts.
Shop Coating and Lining	
Cement Mortar Lining with Seal Coat	ANSI/AWWA C104/A21.4.
Universal Primer	Manufacturer’s standard. If in contact with treated or potable water, certify as being in compliance with ANSI/NSF 61.
Liquid Epoxy	ANSI/AWWA C210, non-coal tar modified, or when in contact with treated or potable water, certify as being in compliance with ANSI/NSF 61.
Anti-Seize Thread Lubricant	Jet-Lube "Nikal", John Crane "Thred Gard Nickel", Bostik/Never-Seez "Pure Nickel Special" or Permatex "Nickel Anti-Seize."
Corrosion Protection	

Polyethylene Encasement	Seamless, ASTM D4976 and ANSI/AWWA C105/A21.5; LLDPE - 12 mil , HDCLPE - 4 mil , V-Bio – 8 mil

2.3 JOINTS

A. Joints in buried and tunnel locations shall be mechanical or push-on type unless otherwise indicated on the Drawings or where required to connect to existing piping or to valves. Bells on wall castings and wall sleeves shall be mechanical joint type, with tapped holes for tie rods or stud bolts. All other joints shall be flanged unless otherwise indicated on the Drawings.

B. Certification of joint design shall be provided in accordance with ANSI/AWWA C111/A21.11, Performance Requirements, as modified herein. The joint test pressure shall be not less than 2 times the working pressure rating of the joint. The same certification and testing shall also be provided for restrained joints. For restrained joints, the piping shall not be blocked to prevent separation and the joint shall not leak or show evidence of failure. It is not necessary that such tests be made on pipe manufactured specifically for this project. Certified reports covering tests made on other pipe of the same size and design as specified herein and manufactured from materials of equivalent type and quality may be accepted as adequate proof of design. Any new proof-of-design testing to meet the requirements for this project shall be independently verified and the Owner shall be given the opportunity to witness the testing.

C. Unless otherwise indicated on the drawings or acceptable to the Engineer, field closure pieces shall be located away from the bends or dead ends beyond the length over which joints are to be restrained.

D. The length of pipe having restrained joints shall be as indicated on the drawings or specified. All vertical bends and eccentric reducers shall have restrained joints.

E. Flanged Joints

1. Pipe shall extend completely through screwed-on flanges. The pipe end and flange face shall be finish machined in a single operation. Flange faces shall be flat and perpendicular to the pipe centerline.

F. Dismantling Joints

1. Dismantling joints shall be provided for restrained couplings 6 inch and larger piping where indicated on the Drawings and as specified herein. Dismantling joints shall comply with AWWA C219 and shall be restrained flange by flange couplings manufactured as a single unit. Unless otherwise indicated on the Drawings, dismantling joints shall be restrained.The inner and outer surfaces of dismantling joints, except flange mating surfaces, shall be prepared for coating in accordance with instructions of the coating manufacturer and shall then be shop coated with liquid epoxy in accordance with ANSI/AWWA C210. The flange mating surfaces shall be cleaned and shop primed with universal primer.

G. Mechanical Couplings

1. The piping layout for mechanical couplings shall provide a space of at least 1/4 inch , but not more than 1 inch , between the pipe ends.

2. All surfaces, including the interior surfaces of the middle rings, shall be prepared for coating in accordance with instructions of the coating manufacturer and shall be shop coated with 16 mils liquid epoxy in accordance with ANSI/AWWA C210.

3. A ductile iron pipe factory spacer shall be provided for the piping where indicated on the drawings. The spacer shall be shop lined and coated with 16 mils of liquid epoxy. Piping surfaces within the coupling shall be shop coated with 16 mils of liquid epoxy.

4. Tie bolts shall be provided to restrain mechanical coupling connections where indicated on the Drawings. The connecting pipe shall be furnished with welded retainer rings as recommended by pipe manufacturer. The pipe manufacturer shall also coordinate the restrained connection with the pressure rating, length, and diameter dimensions of the mechanical coupling being furnished to assure proper clearance is provided for completing the restrained coupling installation.

2.4 REDUCERS

A. Reducers shall be concentric as indicated on the Drawings.

2.5 WALL AND FLOOR SLEEVES

A. Wall and floor sleeves shall be installed where indicated on the Drawings and shall be installed where ductile iron pipe passes through concrete walls and floors or masonry walls, unless otherwise noted. To minimize sleeve size, piping on either side of the sleeve shall be provided with a screw-on flange, grooved coupling, or mechanical coupling with anchor studs to allow the pipe to pass through the sleeve. Where required, sleeves in masonry walls may be enlarged enough for flange or other joint restraint to pass through the sleeve.

B. Where specified or indicated on the Drawings, one or two sets of modular casing seals shall be installed at the face of walls to seal against soil or provide a dust or water tight seal. Contractor shall coordinate the diameter of wall or floor sleeves with the modular casing seal manufacturer. When soil may be present at wall sleeves, two sets of modular casing seals shall be installed, one at each face of the wall. Unless otherwise indicated on the Drawings, modular casing seals shall not be used in submerged conditions unless the hydrostatic pressure is less than 20 feet and piping is less than 24 inch size.

2.6 PCCP PIPE ADAPTERS

A. PCCP pipe adapters shall be provided as needed to connect to PCCP. Contractor shall use restrained PCCP bell and spigot adapters with mechanical joint bells.

2.7 SHOP COATING AND LINING

A. The interior of all pipe and fittings, unless noted otherwise, shall be cement mortar lined.

B. The exterior surfaces of all pipe and fittings which will be exposed in both interior and exterior locations shall be shop primed. Flange faces shall be coated with a suitable rust-preventive compound. Exterior surfaces of all other pipe and fittings shall be coated with asphaltic coating.

PART 3 - EXECUTION

3.1 INSPECTION

A. Pipe and fittings shall be carefully examined for cracks and other defects immediately before installation; pipe ends shall be examined with particular care. All defective pipe and fittings shall be removed from the site.

3.2 PROTECTION AND CLEANING

A. The interior of all pipe and fittings shall be thoroughly cleaned of all foreign material prior to installation and shall be kept clean until the work is completed. Before jointing, all joint contact surfaces shall be wire brushed if necessary and wiped clean.

B. Precautions shall be taken to prevent foreign material from entering the pipe during installation. Debris, tools, clothing, or other objects shall not be placed in or allowed to enter the pipe.

C. Whenever pipe laying is stopped, the open end of the pipe shall be closed to prevent entry of dirt, mud, rodents, and other material. All water in the trench shall be removed prior to removing the closure.

3.3 CUTTING PIPE

A. Cutting shall be done in a neat manner, without damage to the pipe or the lining. Cuts shall be smooth, straight, and at right angles to the pipe axis. After cutting, the ends of the pipe shall be dressed with a file or a power grinder to remove all roughness and sharp edges. The cut ends of push-on joint pipe shall be suitably beveled.

B. All field cutting of existing gray cast iron pipe shall be done with mechanical pipe cutters, except where the use of mechanical cutters would be difficult or impracticable.

C. Ends of ductile iron pipe shall be cut with a portable guillotine saw, abrasive wheel, saw, milling cutter, or oxyacetylene torch. The use of hydraulic squeeze type cutters will not be acceptable. Field-cut holes for saddles shall be cut with mechanical cutters; oxyacetylene cutting will not be acceptable.

D. Contractor shall use factory prepared pipe ends unless a field cut is required for connections.

3.4 ALIGNMENT AND GRADE

A. Buried piping shall be laid to the lines and grades indicated on the Drawings and as specified. Pipelines or runs intended to be straight shall be laid straight. Deflections from a straight line or grade shall not exceed the values stipulated for full-length push-on joint pipe for full-length mechanical joint pipe of AWWA C600, unless specially designed bells and spigots are provided. Contractor shall submit his proposed methods to measure deflection of deflected joints in accordance with the Submittal section.

B. Whenever deflections would exceed the values stipulated in AWWA C600, either shorter pipe sections or fittings shall be installed where needed to conform to the alignment or grade indicated on the Drawings and as acceptable to the Engineer.

C. Unless otherwise specified or acceptable to Engineer, laser beam equipment, surveying instruments, or other suitable means shall be used to maintain alignment and grade. At least one elevation reading shall be taken on each length of pipe. If laser beam equipment is used, periodic elevation measurements shall be made with surveying instruments to verify accuracy of grades. If such measurements indicate thermal deflection of the laser beam due to differences between the ground temperature and the air temperature within the pipe, precautions shall be taken to prevent or minimize further thermal deflections.

D. Additional requirements for alignment and grade are covered in the Project Requirements and Trenching and Backfilling sections and on the Drawings.

E. Tolerances

1. Each section of pipe shall be laid to the alignment and grade indicated on the Drawings and pipe laying schedule with pipe ends within the following tolerances;

    a. +/- 0.10 foot in grade at any point
    b. +/- 0.20 foot in alignment at any point

2. In addition, piping shall be visually straight or on a smooth curve between the points of defection or curvature indicated on the Drawings. Stricter tolerances than specified above shall be used as necessary to maintain minimum cover, to maintain required clearances, to make connections to existing pipe, to maintain the correct slope to avoid high or low points along the pipeline other than at locations indicated on the Drawings, or to meet other restrictions as required or directed by the Engineer.

3.5 LAYING PIPE

A. Buried pipe shall be protected from lateral displacement by placing the specified pipe embedment material installed as specified in the Trenching and Backfilling section. Under no circumstances shall pipe be laid in water, and no pipe shall be laid under unsuitable weather or trench conditions. Pipe embedment material and trench backfill shall be placed and compacted under and around each side of outlets and fittings to hold the pipe in proper position and alignment during the subsequent pipe jointing, embedment, and backfilling.

B. Pipe shall be laid with the bell ends facing the direction of laying, except where reverse laying is specifically acceptable to Engineer.

3.6 JOINTS

A. Each joint, including restrained joints, shall be checked by Contractor as recommended by the pipe manufacturer to verify that the joint and the restraints are installed properly. Restrained joints shall be extended after they are assembled to minimize further take-up.

3.7 MECHANICAL JOINTS

A. Mechanical joints shall be carefully assembled in accordance with the pipe manufacturer's recommendations. If effective sealing is not obtained, the joint shall be disassembled, thoroughly cleaned, and reassembled. Bolts shall be uniformly tightened to the torque values listed in Appendix A of ANSI/AWWA C111/A21.11. Over tightening of bolts to compensate for poor installation practice will not be acceptable.

B. The holes in mechanical joints with tie rods shall be carefully aligned to permit installation of the tie rods. In flange and mechanical joint pieces, holes in the mechanical joint bells and the flanges shall straddle the top centerline for horizontal piping.

3.8 PUSH-ON JOINTS

A. The pipe manufacturer's instructions and recommendations for proper jointing procedures shall be followed. All joint surfaces shall be lubricated with a soap solution provided by the pipe manufacturer immediately before the joint is completed. Lubricant shall be suitable for use in potable water, shall be stored in closed containers, and shall be kept clean. Each spigot end shall be suitably beveled to facilitate assembly.

B. Pipe ends for restrained joint pipe shall be prepared in accordance with the pipe manufacturer's recommendations.

3.9 FLANGED JOINTS

A. Pipe shall extend completely through screwed-on flanges. The pipe end and flange face shall be finish machined in a single operation. Flange faces shall be flat and perpendicular to the pipe centerline.

B. When bolting flanged joints, care shall be taken to avoid restraint on the opposite end of the pipe or fitting which would prevent uniform gasket compression or would cause unnecessary stress in the flanges. One flange shall be free to move in any direction while the flange bolts are being tightened. Bolts shall be tightened gradually in a crisscross pattern and at a uniform rate, to ensure uniform compression of the gasket around the entire flange. All flange joint bolting procedures shall be in accordance with the pipe manufacturer's recommendations.

C. Special care shall be taken when connecting piping to any pumping equipment, including the pitless adapter, to ensure that piping stresses are not transmitted to the flanges. All connecting piping shall be permanently supported to obtain accurate matching of bolt holes and uniform contact over the entire surface of flanges before any bolts are installed in the flanges.

D. Pump connection piping and pitless adapter shall be free to move parallel to its longitudinal centerline while the bolts are being tightened. Each pump shall be leveled, aligned, and wedged into position which will fit the connecting piping, but shall not be grouted until the initial fitting and alignment of the pipe, so that the pump may be shifted on its foundation if necessary to properly install the connecting piping. Each pump shall, however, be grouted before final bolting of the connecting piping.

E. After final alignment and bolting, the pump connections and pitless adapter shall be tested for applied piping stresses by loosening the flange bolts which, if the piping is properly installed, should result in no movement of the piping relative to the pump, adapter, or opening of the pump connection joints. If any movement is observed, the piping shall be loosened and re-aligned as needed and then the flanges bolted back together. The flange bolts shall then be loosened and the process repeated until no movement is observed.

3.10 DISMANTLING JOINTS

A. Dismantling joints shall be installed in accordance with the coupling manufacturer's recommendations.

3.11 MECHANICAL COUPLINGS

A. Mechanical couplings shall be installed in accordance with the coupling manufacturer's recommendations. A space of at least 1/4 inch , but not more than 1 inch , shall be left between the pipe ends. Pipe and coupling surfaces in contact with gaskets shall be clean and free from dirt and other foreign matter during assembly. All assembly bolts shall be uniformly tightened so that the coupling is free from leaks, and all parts of the coupling are square and symmetrical with the pipe. Following installation of the coupling, damaged areas of shop coatings on the pipe and coupling shall be repaired to the satisfaction of Engineer.

3.12 CORROSION PROTECTION

A. Polyethylene Encasement

1. All buried pipe including all straight pipe, bends, tees, adapters, closure pieces, and other fittings or specials, shall be provided with at least one wrap of polyethylene encasement. Other locations where ductile iron pipe and accessories shall be double wrapped with polyethylene encasement shall be as specified herein. Where ductile iron pipe is also embedded or encased in concrete, the polyethylene encasement shall be installed around the pipe for 5 feet extending into each end of the concrete encasement.

2. Where the ductile iron pipe is embedded within a concrete structure wall, floor or footing, the polyethylene encasement for the pipe shall end at the outside faces of the structure. Ductile iron pipe embedded within concrete structures shall not be wrapped with polyethylene encasement.

3. All buried flanged valves, mechanical joint couplings with tie rods, mechanical couplings, restrained mechanical couplings and other pipe harness assemblies at valves or structure walls shall be provided with two wraps of polyethylene encasement in addition to other corrosion protection coatings as specified herein.

4. Polyethylene tube protection shall be installed in accordance with ANSI/AWWA C105/A21.5, Method A. Preparation of the pipe shall include, but shall not be limited to, removal of lumps of clay, mud, cinders, etc., prior to installation.

5. The terms "polyethylene tube protection" and "polyethylene encasement" are interchangeable and shall have the same meaning in these Contract Documents.

    a. Inspection and Testing
        1) Tests for preliminary acceptance of polyethylene encasement materials as required in the submittal paragraph shall be made at the expense of the Contractor.
        2) At the Owner's expense, the Owner may obtain samples from the material supplied in the field and have test conducted of the requirements specified in ANSI/AWWA C105/A21.5 by an independent third-party laboratory.

3.13 CONNECTIONS WITH EXISTING PIPING

A. Connections between new work and existing piping shall be made using fittings suitable for the conditions encountered. Each connection with an existing pipe shall be made at a time and under conditions which will least interfere with service to customers, and as authorized by Owner. Facilities shall be provided for proper dewatering and for disposal of all water removed from dewatered lines and excavations without damage to adjacent property.

B. Special care shall be taken to prevent contamination when dewatering, cutting into, and making connections with existing potable water piping. Trench water, mud, or other contaminating substances shall not be permitted to enter the lines. The interior of all pipe, fittings, and valves installed in such connections shall be thoroughly cleaned and then all connections with potable water pipelines shall be cleaned and disinfected as specified in the Cleaning and Disinfection of Water Pipelines section.

3.14 REACTION ANCHORAGE AND BLOCKING

A. Concrete blocking shall be installed where indicated on the Drawings. Concrete and reinforcing steel shall be as specified in the Cast-in-Place Concrete section.

B. The blocking size shall be of the dimensions indicated on the Drawings, shall extend from the fitting to solid, undisturbed earth, and shall be installed so that all joints are accessible for

repair. If adequate support against undisturbed ground cannot be obtained, restrained joints shall be installed to provide the necessary support. If the lack of suitable solid vertical excavation face is due to improper trench excavation, restrained joints shall be furnished and installed by and at the expense of Contractor.

C. Reaction blocking, anchorages, or other supports for fittings installed in fills or other unstable ground, installed above grade, or exposed within structures, shall be provided as indicated on the Drawings.

D. All ferrous metal clamps, rods, bolts, and other components of tapping saddles, reaction anchorages, or joint harness, subject to submergence or in contact with earth or other fill material and not encased in concrete, shall be protected from corrosion as specified in the Corrosion Protection paragraph of this section.

3.15 PRESSURE AND LEAKAGE TESTS

A. After installation, pipe and fittings shall be subjected to a pressure test and a leakage test in accordance with the Pipeline Pressure and Leakage Testing section.

B. All pipe, fittings, valves, pipe joints, and other materials which are found to be defective shall be removed and replaced with new and acceptable materials, and the affected portion of the piping shall be retested by and at the expense of Contractor.

C. All joints shall be watertight and free from visible leaks. Any visible leak which is discovered within the correction period stipulated in the General Conditions shall be repaired by and at the expense of Contractor.

3.16 CLEANING AND DISINFECTION

A. The interior of all pipe and fittings shall be thoroughly cleaned before installation and shall be kept clean of any foreign matter until the work has been accepted. All joint contact surfaces shall be kept clean until the joint is completed.

B. After installation, all potable water pipelines shall be cleaned and disinfected as specified in the Cleaning and Disinfection of Water Pipelines section.

End of Section

SECTION 15067 - MISCELLANEOUS PLASTIC PIPE, TUBING, AND ACCESSORIES

PART 1 - GENERAL

1.1 SCOPE

A. This section covers the furnishing of miscellaneous plastic pipe, tubing, and accessories. Pipe and tubing shall be furnished complete with all fittings, flanges, unions, jointing materials and other necessary appurtenances.

1.2 SUBMITTALS

A. Drawings and Data

1. Complete specifications, data and catalog cuts or drawings shall be submitted in accordance with the Submittals Procedures section. Submittals are required for all piping, fittings, gaskets, sleeves, and accessories, and shall include the following data:

a. Name of Manufacturer
b. Type and model
c. Construction materials, thickness, and finishes
d. Pressure and temperature ratings

1.3 DELIVERY, STORAGE, AND HANDLING

A. Shipping shall be in accordance with the Product Delivery Requirements section. Handling and storage shall be in accordance with the Product Storage and Handling Requirements section. All materials shall be stored in a sheltered location above the ground, separated by type, and shall be supported to prevent sagging or bending.

B. Pipe, tubing, and fittings shall be stored between 40°F and 90°F.

PART 2 - PRODUCTS

2.1 PVC PIPE MATERIALS

A. PVC pipe materials and services shall be as specified herein.

B. Material Classification PVC-2

PVC-2 – Schedule 80 PVC Pipe with Solvent Welded Joints. Stilling well pipe.	Pipe Fittings	ASTM D1785, Cell Classification 12454, bearing NSF seal, Schedule 80. ASTM D2467, Cell Classification 12454, bearing NSF seal. Flanges or unions shall be provided where needed to facilitate disassembly of equipment or valves. Flanges or unions shall be joined to the pipe by a solvent weld. When acceptable to Engineer, threaded joints may be used instead of solvent welded joints in exposed interior locations for the purpose of facilitating assembly. The use of threaded joints in this system shall be held to a minimum.

C. Material Classification PVC-4

D.

PVC-4 – PVC DWV Pipe (Single Wall) with Solvent Welded Joints. Air/vacuum release drainage drain piping from equipment.	Pipe Fittings	ASTM D1785, cell classification 12454, bearing NSF seal. ASTM D2665 and ASTM D3311, cell classification 12454, bearing NSF seal.

E. Accessory Materials

1. Accessory materials for the PVC Pipe systems shall be as indicated.

Flanges	Diameter and drilling shall conform to ANSI/ASME B16.5, Class 150. Schedule 80 for DWV systems.
Flange Bolts and Nuts	ASTM A307, Grade B, length such that, after installation, the bolts will project 1/8 to 3/8 inch beyond outer face of the nut. Stainless steel
Flat Washers	ANSI B18.22.1, plain. Same material as bolts and nuts.

Flange Gaskets	Full face, 1/8 inch thick, chemical-resistant elastomeric material suitable for the specified service.
Expansion Joints	Edlon "Thermo-molded TFE" or Resistoflex "Style R6905" molded expansion joint.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Materials furnished under this section will be installed in accordance with the Miscellaneous Piping and Accessories Installation section.

End of Section

SECTION 15070 -- COPPER TUBING AND ACCESSORIES

PART 1 - GENERAL

1.1 SCOPE

A. This section covers the furnishing of copper tubing and accessories. Copper tubing shall be furnished complete with all fittings, flanges, unions, and other accessories specified herein.

1.2 SUBMITTALS

A. Drawings and Data

1. Complete specifications, data, and catalog cuts or drawings shall be submitted in accordance with the Submittals Procedures section. Submittals are required for all piping, fittings, gaskets, sleeves, and accessories, and shall include the following data:

a. Name of Manufacturer
b. Type and model
c. Construction materials, thickness, and finishes
d. Pressure and temperature ratings

B. Gasket Material Certification.

1. Contractor shall obtain and submit a written statement from the gasket material manufacturer certifying that the gasket materials are compatible with the joints specified herein and are recommended for the specified field test pressures and service conditions.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Shipping shall be in accordance with the Product Delivery Requirements section. Handling and storage shall be in accordance with the Product Storage and Handling Requirements section. All materials shall be stored in a sheltered location above the ground, separated by type, and shall be supported to prevent sagging or bending.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Copper tubing materials and service shall be as specified herein.

B. Material Classification CU-1

CU-1 – Water Tubing with Flared Fittings	Tubing	Soft annealed copper tubing, ASTM B88, Type K.
Buried water supply, 2 inch and smaller.	Fittings	Flared, material to match tubing. Fittings shall conform to ANSI/ASME B16.26.

C. Accessory Materials

1. Accessory materials for the copper tubing systems shall be as indicated.

Flange Bolts and Nuts	ASTM A307, Grade B, length such that, after installation, the bolts will project 1/8 to 3/8 inch beyond outer face of the nut.
Flange Gaskets	ASTM D1330, Grade I, red rubber, ring type, 1/8 inch thick.
Expansion Joints	Tempflex "Model HB Expansion Compensators" with copper tube ends.
Insulating Fittings	
Threaded	Dielectric steel pipe nipple, ASTM A53, Schedule 40, poly-propylene lined, zinc plated; Perfection Corp. "Clearflow Fittings".
Flanged	Epco "Dielectric Flange Unions" or Central Plastics "Insulating Flange Unions".

PART 3 - EXECUTION

3.1 INSTALLATION

A. Materials furnished under this section will be installed in accordance with the Miscellaneous Piping and Accessories Installation section.

End of Section

SECTION 15091 - MISCELLANEOUS BALL VALVES

PART 1 - GENERAL

1.1 SCOPE

A. This section covers the furnishing of manually operated or remote activated two position (open-close) ball valves as specified herein.

B. Miscellaneous ball valves shall be provided where AWWA type ball valves are not required.

C. Piping, pipe supports, insulation, and accessories that are not an integral part of the valves or are not specified herein are covered in other sections.

1.2 GENERAL

A. General Equipment Stipulations

1. The General Equipment Stipulations shall apply to all equipment and materials furnished under this section. If the requirements in this section are different from those in the General Equipment Stipulations, the requirements in the section shall take precedence.

B. Identification

1. Valves specified herein shall be tagged in accordance with the Equipment and Valve Identification section.

1.3 SUBMITTALS

A. General Drawings and Data.

1. Complete drawings, details, and specifications covering the valves and their appurtenances shall be submitted in accordance with the Submittals Procedures section. Included in the submittal shall be drawings by the valve manufacturer to indicate the position of the valve actuator and valve shaft.

PART 2 - PRODUCTS

2.1 CONSTRUCTION

A. Ball valves shown on the drawing, but not specified herein, shall be selected to match piping material they are installed in.

B. Valves Type VB-1

VB-1 Ball valves for water service in metallic piping systems. 2 inch and smaller	Rating	500 psi nonshock cold WOG MSS SP-110
	Code	In-line, two piece, end entry, full port
	Type	ASTM B584–C84400 bronze
	Body/Bonnet	
	Trim	Reinforced Teflon
	Seat	Brass, or chrome plated brass
	Ball	Brass or bronze
	Stem	Reinforced Teflon
	Thrust Washer	Teflon or Viton
	Stem Seal	Threaded End
	End Connection	-20 to 400°F
	Temp. Limitations	Lever
	Valve Operator	Conbraco Industries "Apollo 77-100 Series"; Powell "Fig 4210T"
	Manufacturers	

C. Valves Type VB-6

VB-6 Compressed air, water service 3 inch and larger Flanged	Rating	Class 150
	Type	In-line, end entry, regular port
	Body/Bonnet	ASTM A216-WCB, cast steel
	Trim	
	Seat	Reinforced Teflon
	Ball	ASTM A216-WCB, steel, chrome plated
	Stem	ASTM A108-CS
	Thrust Washer	Reinforced Teflon
	Body Seal	Reinforced Teflon
	Stem Seal	Manufacturer's standard
	End Connection	Flanged, ASME B16.5, Class 150, raised face
	Temp. Limitations	-20 to 400°F
	Valve Operator	Lever
	Manufacturers	Conbraco Industries "Apollo 88A-100 Series", Neles-Jamesbury "5000 Series", Powell "Fig 4224T"

D. Length Tolerance

1. Unless otherwise specified, the actual length of valves shall be within plus or minus 1/16 inch of the specified or theoretical length.

E. Shop Coatings

1. All ferrous metal surfaces of valves and accessories, both interior and exterior, shall be shop coated for corrosion protection. The valve manufacturer's standard coating will be acceptable, provided it is functionally equivalent to the specified coating.

Coating Materials	
Coal Tar Epoxy	High-build coal tar epoxy; Ameron "Amercoat 78HB Coal Tar Epoxy", Carboline "Bitumastic 300 M", Tnemec "46H-413 Hi-Build Tneme-Tar", or Sherwin-Williams "Hi-Mil Sher-Tar Epoxy".
Epoxy Enamel (for liquid service)	Ameron "Amerlock 400 High-Solids Epoxy Coating", Carboline "Carboguard 891", or Tnemec "Series N140 Pota-Pox Plus".
Rust-Preventive Compound	As recommended by the manufacturer.
Surfaces To Be Coated	
Unfinished Surfaces	
Interior Surfaces	
Liquid Service	Epoxy enamel.
Exterior Surfaces of Valves To Be Buried, Submerged, or Installed in Manholes or Valve Vaults	Coal tar epoxy.
Exterior Surfaces of all other valves	Universal primer.

2.2 VALVE ACTUATORS

A. Ball valve, except those which are equipped with power actuators or are designed for automatic operation, shall be provided with manual actuators. Unless otherwise specified or indicated on the drawings, each manual actuator shall be equipped with a lever operator. Ball valves with center lines more than 7’-6” above the floor shall be provided with chain levers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Materials furnished under this section shall be installed in accordance with the Valve Installation section.

End of Section

SECTION 15093 - CHECK VALVES

PART 1 - GENERAL

1.1 SCOPE

A. This section covers the furnishing of check valves as specified herein.

B. Piping, pipe supports, insulation, and accessories that are not an integral part of the valves or are not specified herein are covered in other sections.

1.2 GENERAL

A. Equipment furnished under this section shall be fabricated and assembled in full conformity with Drawings, Specifications, engineering data, instructions, and recommendations of the equipment manufacturer unless exceptions are noted by Engineer.

B. Valves shall be furnished with all necessary parts and accessories indicated on the Drawings, specified, otherwise required for a complete, properly operating installation and shall be the latest standard products of a manufacturer regularly engaged in the production of valves.

C. General Equipment Stipulations

1. The General Equipment Stipulations shall apply to all equipment furnished under this section. If requirements in this specification differ from those in the General Equipment Stipulations, the requirements specified herein shall take precedence.

D. Temporary Number Plates

1. Not used.

E. Identification

1. Valves specified herein shall be tagged in accordance with the Equipment and Valve Identification section.

1.3 SUBMITTALS

A. Drawings and Data.

1. Complete drawings, details, and specifications covering the valves and their appurtenances shall be submitted in accordance with the Submittals Procedures section. Included in the submittal shall be drawings by the valve manufacturer to indicate the position of the valve actuator and valve shaft.

PART 2 - PRODUCTS

2.1 CONSTRUCTION.

A. Manufacturers shall be Kennedy Valve or ValMatic.

B. Check valves shall be ductile iron body with reinforced Buna N rubber flapper rated for 250 psi working pressure, 500 psi hydrostatic test for structural soundness, and ANSI 16.42 – Class 150 flanged end connections.

C. Check valve body shall have full flow equal to nominal pipe diameter at all points of valve. Body shall be of ductile iron construction to ASTM-A-536-65-45-12. Castings shall be clean, sound and without defects. No plugging or welding of such defects will be allowed. The seating surface will be at a 45 degree angle to minimize water hammer.

D. Rubber Clapper & Hinge shall be constructed of ductile iron to ASTM-A 536-65-45-12. Both Clapper and hinge shall have permanently bonded Buna-N rubber with a metal reinforcement connecting the hinge to the clapper.

E. The top cover plate will be ductile iron to ASTM-A536-65-45-12 and must be of full size to allow removal of the disc without removing the valve from line. All exterior nuts and bolts shall be 304 or 316 stainless steel.

F. All iron parts inside and out will be fusion bonded epozy coated. All coatins must be NFS-61 approved for use in drinking water systems.

G. Check Valves shall have an external mechanical position indicator

H.

VC-6 Water, sludge, or liquid service 2-1/2 inch and larger pipe	Rating	Class 125
	Code	AWWA C508
	Type	Horizontal swing, bolted bonnet
	Body/Bonnet	ASTM A126 Class B cast iron
	Trim	
	Seat Ring	Bronze
	Disc	Bronze
	Hinge Pins	Bronze or brass
	Bushings	Bronze
	Cover Gasket	Manufacturer’s standard
	End Connection	Flanged, ASME B16.1 Class 125, flat faced
	Temp. Limitations	-20 to 212°F
	Manufacturers	Kennedy Valve, ValMatic, or equal

I. Shop Coatings

1. All ferrous metal surfaces of valves and accessories, both interior and exterior, shall be shop coated for corrosion protection. The valve manufacturer's standard coating will be acceptable, provided it is functionally equivalent to the specified coating.

Coating Materials

Coal Tar Epoxy	High-build coal tar epoxy; Ameron "Amercoat 78HB Coal Tar Epoxy", Carboline "Bitumastic 300 M", Tnemec "46H-413 Hi-Build Tneme-Tar", or Sherwin-Williams "Hi-Mil Sher-Tar Epoxy".
Epoxy Enamel (for liquid service)	Ameron "Amerlock 400 High-Solids Epoxy Coating", Carboline "Carboguard°891", or Tnemec "Series N140 Pota-Pox Plus".
Rust-Preventive Compound	As recommended by the manufacturer.

Surfaces To Be Coated

Unfinished Surfaces	
Interior Surfaces	
Liquid Service	Epoxy enamel.
Exterior Surfaces of Valves To Be Buried, Submerged, or Installed in Manholes or Valve Vaults	Asphalt varnish or coal tar epoxy.
Exterior Surfaces of All Other Valves	Universal primer.
Polished or Machined Surfaces	Rust-preventive compound.
Actuators and Accessories	Universal primer.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Materials furnished under this section shall be installed in accordance with Valve Installation section.

End of Section

Schedule 15093-S01
Check Valves Schedule

1.010	1.020	1.030	1.040	1.050	1.060
Tag Number	**Size**	**Type of Valve**	**Service**	**Design Capacity**	**Ends(1)**
	(in)			(gpm)	
VW2R-VCK-001	12	Raw Water	Pump Discharge	3500	F
VW3R-VCK-001	10	Raw Water	Pump Discharge	2000	F
VW4R-VCK-001	12	Raw Water	Pump Discharge	3500	F
VW5R-VCK-001	12	Raw Water	Pump Discharge	3500	F

Notes:

(1) Abbreviations for valve ends are as indicated:

F
MJ
P

END OF SCHEDULE

SECTION 15100 - MISCELLANEOUS VALVES AND HYDRANTS

PART 1 - GENERAL

1.1 SCOPE

A. This section covers the furnishing of miscellaneous valves as specified herein and as indicated in the Yard Hydrant Schedule, except where specific requirements are stipulated in other sections.

1.2 GENERAL

A. General Equipment Stipulations

1. The General Equipment Stipulations shall apply to all equipment furnished under this section. If requirements in this specification differ from those in the General Equipment Stipulations, the requirements specified herein shall take precedence.

B. Identification

1. Valves specified herein shall be tagged in accordance with the Equipment and Valve Identification section.

1.3 SUBMITTALS

A. Drawings and Data

1. Complete drawings, details, and specifications, covering the valves and their appurtenances shall be submitted in accordance with the Submittals Procedures section. Included in the submittal shall be drawings by the valve manufacturer to indicate the position of the valve actuator and valve shaft.

PART 2 - PRODUCTS

2.1 CONSTRUCTION

A. Length Tolerance

1. Unless otherwise specified, the actual length of valves shall be within ±1/16 inch of the specified or theoretical length.

B. Shop Coatings

1. All ferrous metal surfaces of valves and accessories, both interior and exterior, shall be shop coated for corrosion protection. The valve manufacturer's standard coating will be acceptable, provided it is functionally equivalent to the specified coating.

Coating Materials

Epoxy (for liquid service)	PPG Amercoat "Amerlock 400 High-Solids Epoxy Coating", Carboline "Carboguard 891", Sherwin-Williams "Macropoxy 646NSF"or Tnemec "Series N140 Pota-Pox Plus".
Rust-Preventive Compound	As recommended by the manufacturer.
Surfaces To Be Coated	
Unfinished Surfaces	
Interior Surfaces	
Liquid Service	Epoxy enamel.
Exterior Surfaces of Valves to be Buried, Submerged, or Installed in Manholes or Valve Vaults	Epoxy.
Exterior Surfaces of all Other Valves	Universal primer.
Polished or Machined Surfaces	Rust-preventive compound.
Actuators and Accessories	Universal primer.

2.2 HOSE FAUCETS, HYDRANTS, AND CURB STOPS.

A. Yard Hydrants

Post type yard hydrant	TypeBody	2” Nonfreeze, PFOA Free, draining post type.
	Trim	Brass or bronze.
	Seat	Manufacturer’s standard.
	Disc	Manufacturer’s standard.
	Stem	Manufacturer’s standard.
	Stem Seal	Manufacturer’s standard.
	End Connection	Manufacturer’s standard.
		Threaded, NPT x HPT.
	Temp. Limitations	32°F to 212°F .
	Valve Operator	Lockable Lift Handle
	Manufacturers	Woodford, K2, Kupferle, or Zurn

2.3 VALVE ACTUATORS

A. Requirements for valve actuators shall be as specified in the Valve and Gate Actuator section.

2.4 ACCESSORIES

A. When the Drawings indicate the need for extension stems; position indicator; floor boxes; or operating stands, refer to the Valve and Gate Actuator section.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Materials furnished under this section shall be installed in accordance with the Valve Installation section.

B. Installation Check

1. An installation check by an authorized representative of the manufacturer is not required.

3.2 YARD HYDRANT SCHEDULE

2.000	**Yard Hydrants**				
2.010	Tag Number	VW 2-R	VW 3-R	VW 4-R	VW 5-R
2.011	Quantity	1	1	1	1
2.020	Size				
	inches	3/4	3/4	3/4	3/4
2.030	Type (1)	P	P	P	P
2.040	Design Burial Depth				
	ft	5.0	5.0	5.0	5.0
3.000	**Exceptions, Clarifications, and Comments**				
3.010	Refer to Section 15100				

PART 4 -

A. Notes:

1. (1) Abbreviations for types are as follows:

B Box type
P Post type

End of Section

SECTION 15101 - AWWA BUTTERFLY VALVES

PART 1 - GENERAL

1.1 SCOPE

A. This section covers furnishing of AWWA butterfly valves for cold water service as indicated in the AWWA Butterfly Valve Schedule.

B. AWWA butterfly valves shall be furnished complete with actuators and accessories as specified herein, as indicated in the schedule, and as specified in the Valve and Gate Actuators section.

1.2 GENERAL

A. Equipment provided under this section shall be fabricated and assembled in full conformity with Drawings, Specifications, engineering data, instructions, and recommendations of the equipment manufacturer, unless exceptions are noted by Engineer.

B. Valves shall be furnished with all necessary parts and accessories indicated on the Drawings, specified, or otherwise required for a complete, properly operating installation and shall be the latest standard products of a manufacturer regularly engaged in the production of valves.

C. General Equipment Stipulations

1. The General Equipment Stipulations shall apply to all equipment furnished under this section. If requirements in this specification differ from those in the General Equipment Stipulations, the requirements specified herein shall take precedence.

D. Governing Standard

1. Except as modified or supplemented herein, all butterfly valves and manual actuators shall conform to the applicable requirements of ANSI/AWWA C504.

E. Marking

1. Supplementing the requirements of Section 6.1 of the governing standard, the country of origin of all castings and an identifying serial number shall be stamped on a corrosion-resistant plate attached to the valve body.

F. Temporary Number Plates

1. Each butterfly valve shall be tagged or marked in the factory with the identifying number indicated on the Drawings.

G. Identification

1. AWWA butterfly valves shall be tagged in accordance with the Equipment and Valve Identification section.

1.3 SUBMITTALS

A. Drawings and Data – General

1. Complete drawings, details, and specifications covering the valves and their appurtenances shall be submitted in accordance with the Submittals Procedures section. Included in the submittal shall be drawings by the valve manufacturer to indicate the position of the valve actuator and valve shaft.

B. Certified Test Results.

1. Certified copies of test results for tests described in Section 5 of the governing standard, shall be submitted to Engineer before the valves are shipped. An affidavit of compliance with the governing standard for valves 72 inches and smaller and for valves 78 inches and larger shall be provided as indicated in Section 6.3 of ANSI/AWWA C504.

PART 2 - PRODUCTS

2.1 ACCEPTABLE PRODUCTS

A. Butterfly valves shall be by DeZurik, M&H, VSI, or equal..

2.2 MATERIALS

A. Except as modified or supplemented herein, materials used in the manufacture of butterfly valves shall conform to the requirements of the governing standard.

B. Acceptable shop coatings are listed in the following table.

Epoxy

For Raw or Treated Water Service in potable water facilities (NSF certified)	PPG Amercoat “Amerlock 400 High Solids Epoxy”, Carboline “Carboguard 891”, Sherwin-Williams "Macropoxy 646NSF" or Tnemec “Series N140 Pota-Pox Plus”.
Rust-Preventive Compound	As recommended by manufacturer.

2.3 VALVE CONSTRUCTION.

A. Valve Bodies

1. Valves shall be short-body type unless otherwise specified in the AWWA Butterfly Valve Schedule. 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.

B. Flanges

1. Flanges shall be finished to true plane surfaces within a tolerance limit of 0.005 inch . The finished face shall be normal to the longitudinal valve axis within a maximum angular variation tolerance of 0.002 inch per foot (0.017 percent) of flange diameter.

C. Mechanical Joint Ends

1. Mechanical joint ends shall be either mechanical joint or push-on ends conforming to ANSI/AWWA C111/A21.11.

D. Valve Shafts

1. Valve shafts shall be fabricated of AISI Type 304 or 316 stainless steel. The use of shafts having a hexagonal cross section will not be acceptable. The connection between shaft and disc shall be in accordance with the governing standard.

2. The connection between the shaft and the disc shall be mechanically secured by means of solid, smooth sided, stainless steel or monel taper pins or dowel pins. Each taper pin or dowel pin shall extend through or shall wedge against the side of the shaft and shall be mechanically secured in place. The use of set screws, knurled or fluted dowel pins, expansion pins, roll pins, tension pins, spring pins, or other devices instead of the pins specified herein will not be acceptable.

E. Valve Seats

1. Acceptable seating surfaces mating with rubber or EPDM are AISI Type 304 or 316 stainless steel for all valves.

2. Seats shall be located on the valve body or disc. Valve seat configurations which rely on the mating pipe flange to hold the seat in position in the valve body will not be acceptable.

F. Shaft Seals

1. Shaft seals shall be of the chevron type.

2. Valve shall be designed so the actuator may be removed and replaced while the valve is in service without losing water.

G. Thrust Bearings

1. Each valve shall be provided with one or more thrust bearings in accordance with the governing standard. Thrust bearings which are directly exposed to line liquid and which consist of a metal bearing surface in rubbing contact with an opposing metal bearing surface will not be acceptable.

2.4 VALVE ACTUATORS

A. Requirements for valve actuators shall be as specified herein, as indicated in the AWWA Butterfly Valve Schedule, and as specified in the Valve and Gate Actuators section

B. All inch and larger valves shall have geared actuators.

C. If valves with an AWWA class designation higher than specified are furnished, actuator torque capabilities shall be increased accordingly and shall be acceptable to Engineer.

D. Actuator Sizing

1. The valve manufacturer shall size the actuator in accordance with the governing standard , the operating conditions and requirements indicated in the AWWA Butterfly Valve Schedule, and the valve manufacturer's requirements.

2. Unless otherwise indicated or specified, actuator torque requirements shall be based on a maximum differential pressure across the valve equal to the maximum pressure associated with the valve class and a maximum velocity through the valve of 16 feet per second .

2.5 SHOP PAINTING

A. All interior and exterior ferrous metal surfaces, except finished surfaces, bearing surfaces, and stainless steel components, of valves and accessories shall be shop painted for corrosion protection. The valve manufacturer's standard coating will be acceptable, provided it is functionally equivalent to the specified coating and is compatible with the specified field painting.

B. Surfaces shall be painted as follows:

Unfinished Surfaces

Interior Surfaces	Epoxy.
Exterior Surfaces of Valves to be Buried or Installed in Manholes or Valve Vaults	Epoxy
Exterior Surfaces of Valves to be Submerged	Epoxy.
Exterior Surfaces of All Other Valves	Universal primer.

Polished or Machined Surfaces

Flange Faces	Rust-preventive compound.

Other Surfaces	Epoxy.

1. Interior coatings shall comply with ANSI/AWWA C550 and shall be free of holidays. The total dry film thickness of shop-applied coatings shall be not less than:

Type of Coating	Minimum Dry Film Thickness
Epoxy	10 mils
Universal Primer	3 mils

2.6 ACCESSORIES

A. Requirements for extension stems and stem guides, position indicators, floor boxes, operating stands, torque tubes, valve boxes, and extension bonnets shall beas indicated in the AWWA Butterfly Valve Schedule and as specified in the Valve and Gate Actuators section.

PART 3 - EXECUTION

A. INSTALLATION

1. Valves shall be installed in accordance with the Valve Installation section.

2. Installation Check

   a. An experienced, competent, and authorized representative of the manufacturer shall visit the site of the Work and inspect, check, adjust if necessary, and approve the equipment installation. The representative shall be present when the equipment is placed in operation in accordance with Startup Requirements section, and shall revisit the job site as often as necessary until any problems are corrected and the equipment installation and operation are satisfactory in the opinion of Engineer
   b. The manufacturer's representative shall furnish a written report certifying that the equipment has been properly installed and lubricated; is in accurate alignment; is free from any undue stress imposed by connecting piping and appurtenances; and has been operated under full load conditions and that it has operated satisfactorily.
   c. All costs for these services shall be included in the contract price.

B. AWWA BUTTERFLY VALVE SCHEDULE

1. Design conditions for valves identified on the Drawings are as indicated in the AWWA Butterfly Valves Schedule.

End of Section

Schedule 15101-S01
AWWA Butterfly Valves

1.010	1.020	1.030	1.031	1.040	1.060	1.070	1.080	1.090	3.001	3.010	3.020	4.030	3.040	4.040	4.050	4.080	4.090	8.010	8.020	8.040	8.041	8.05	8.060
Tag Number	**Size**	**Type of Service(1)**	**Application**	**Type of Installation(2)**	**AWWA Class(3)**	**Maximum Non-Shock Shutoff Pressure**	**Maximum Differential Pressure**	**Maximum Velocity**	**Type of Electric Actuator(10)**	**Type of Housing(7)**	**Operating Time**	**Power for Electric Actuator**	**Actuator Provides 120 VAC For remote controls**	**Number of Limit Switch Assemblies**	**Position Transmitter**	**Control Devices(9)**	**Remote Control Station (11)**	**Extensions Stems**	**Position Indicator for Buried Valve Actuators**	**Cast Iron Operating Stands**	**Fabricated Steel Operating Stands**	**Torque Tubes**	**Extension bonnet**
	(in)					(psi)	(psi)	(ft/s)			(s)	V/PH											
VW2R-VLV-001	12	M	Raw Water	SV30	F	140	20	8.5	SE	SUB30	60	120/1	Yes	1	Yes	C							
VW3R-VLV-001	10	M	Raw Water	SV30	F	100	15	5.0	SE	SUB30	60	120/1	Yes	1	Yes	C							
VW4R-VLV-001	12	M	Raw Water	SV30	F	110	15	7.5	SE	SUB30	60	120/1	Yes	1	Yes	C							
VW5R-VLV-001	12	M	Raw Water	SV30	F	110	25	7.5	SE	SUB30	60	120/1	Yes	1	Yes	C							

Schedule 15101-S01
AWWA Butterfly Valves

Notes:

(1) Actuators designated "O-C" are for "Open-Close" service. Actuators designated "M" are for "Modulating" service.

(2) Abbreviations for installation types are as follows:

B4	Buried, depth of 4 feet [1.2 m] or less
B20	Buried, depth greater than 4 feet [1.2 m] but 20 feet [6.1 m] or less
Bxx	Buried, depth greater than 20 feet [6.1 m], actual depth of xx feet
SV20	Submerged or vaulted, depth 20 feet [6.1 m] or less
SVxx	Submerged or vaulted, depth greater than 20 feet [6.1 m], actual depth of xx feet
IP	In plant

(3) Suffix letters define valve ends as follows:

F	Flanged
W	Wafer
MJ	Mechanical joint
S	Single Flange

(4) Abbreviations for actuator types are as follows:

WN	Wrench Nut
LVR	Lever
CW	ChainWheel
HW	HandWheel

(5) If a value is indicated, the leakage test shall be performed using this pressure value rather than the pressure indicated by the AWWA class.

(6) Abbreviations for limit switches on manual and cylinder operated valves.

EOT	End of travel (open - close)
PSS	Pump start - stop (two intermediate positions)
ELSCH	See electrical schematics

(7) Abbreviations for electronic or electric actuator housing.

WP	Weatherproof
SUB	Submersible [xx = depth of submergence] (SUBxx)
EXP	Explosion proof

(8) Cylinder actuators shall have torque safety factors applied in accordance with AWWA C504.

(9) Abbreviations for control devices are as indicated.

Table 1: Control Devices				
Abbreviations	Open-Close Push Button	Open-Stop- Close Push Button	Local-Off-Remote	Red and Green Indicator Lights
A	Required		Required	Required
B	Required		Required	
C		Required	Required	Required
D		Required	Required	
E		Required		
F	Required			
G	Required			Required
H		Required		Required

(10) Abbreviations for electric actuator types are as follows:
SE Standard Electric
IE Intelligent Electric
NE Networked Electric

END OF SCHEDULE

(11) Abbreviation for remote control station types:
CS Control Station without Indicating Lights
CIS Control Station with Indicating Lights

SECTION 15108 - AIR VALVES

PART 1 - GENERAL

1.1 SCOPE

A. This section covers furnishing air/vacuum valves as required by the Work.

1.2 GENERAL

A. Equipment provided under this section shall be fabricated and assembled in full conformity with the Drawings, Specifications, engineering data, instructions, and recommendations of the equipment manufacturer, unless exceptions are noted by Engineer.

B. Valves shall be furnished with all necessary parts and accessories indicated on the Drawings, specified, or otherwise required for a complete, properly operating installation and shall be the latest standard products of a manufacturer regularly engaged in the production of valves.

C. General Equipment Stipulations

1. The General Equipment Stipulations shall apply to all equipment furnished under this section. If requirements in this specification differ from those in the General Equipment Stipulations, the requirements specified herein shall take precedence.

D. Governing Standard

1. Except as modified or supplemented herein, all valves furnished under this section shall conform to the applicable performance requirements of ANSI/AWWA C512.

E. Identification

1. Air valves shall be tagged in accordance with the Equipment and Valve Identification section.

1.3 SUBMITTALS

A. Drawings and Data

1. Complete assembly drawings, together with detailed specifications and data covering materials used and accessories forming a part of the valves furnished, shall be submitted in accordance with the Submittals Procedures section.

PART 2 - PRODUCTS

2.1 CONSTRUCTION

A. Three inch and larger air release and vacuum relief valves for vertical diffusion vane pumps shall be of the kinetic energy type with a valve assembly which functions as both an air release and a vacuum relief valve. The valve shall be provided with a surge check valve on the valve inlet or outlet. The valves shall be Apco/Valve and Primer “Series 140DAT Air Valves for Vertical Turbine Pumps” for 3 inch and "Series 1900 Air Valves for Vertical Turbine Pumps" for 4 inch and larger, GA Industries "Figure 931 Slow-Closing Kinetic Air/Vacuum Valve", ARI “No. D-060-HF-NS”, or Multiplex "Crispin Air & Vacuum Valve with Surge Check Valve". The discharge from the valve shall be provided with a flanged connection.

2.2 MATERIALS

A. Except as modified or supplemented herein, materials of construction shall comply with the governing standard.

Valve Trim	Austenitic stainless steel materials.
Float	Austenitic stainless steel
Shop Coatings	
Epoxy (NSF-61 Certified)	PPG Amercoat “Amerlock 400 High Solids Epoxy”, Carboline “Carboguard 891”, Sherwin-Williams "Macropoxy 646NSF" or Tnemec “Series N140 Pota-Pox Plus”.
Rust-Preventive Compound	As recommended by manufacturer.

2.3 SHOP PAINTING

A. All interior and exterior ferrous metal surfaces, except stainless steel components, shall be shop painted for corrosion protection. The valve manufacturer's standard coating will be acceptable, provided it is functionally equivalent to the specified coating and is compatible with the specified field coating. Field painting is covered in the Protective Coatings section.

B. Surfaces shall be painted as indicated:

Interior Surfaces of Valves in Clean Water Applications (Raw or Treated Water in Potable Water Facilities)	NSF-61 Certified Epoxy.
Exterior Surfaces of All Other Valves	Universal primer.

Polished or Machined Surfaces	Rust-preventive compound.

C. Interior epoxy coatings for clean water valves shall comply with ANSI/AWWA C550/NSF 61. Interior coatings for all valves shall be free of holidays. The total dry film thickness of shop-applied coatings shall be not less than:

Type of Coating	Minimum Dry Film Thickness
Epoxy	10 mils
Universal Primer	3 mils

2.4 SHUTOFF VALVES

A. A shutoff valve shall be provided in the piping leading to each air valve. Shutoff valves shall be ball valves as specified in the Miscellaneous Ball Valves section.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Air release and combination air valves shall be installed in accordance with the Valve Installation section.

End of Section

SECTION 15140 – PIPE SUPPORTS

PART 1 - GENERAL

1.1 SCOPE

A. This section covers the furnishing and installation of pipe hangers, brackets, supports, bracing, anchorage, and the design for the pipe support system for pipes 12 inches and smaller. Pipe supports shall be furnished complete with all necessary inserts, bolts, nuts, rods, washers, and other accessories. This section also covers the spacing of expansion joints in pipes 12 inches in diameter and smaller. Expansion joint products and materials are covered in the respective piping sections.

B. This section covers pipe supports for the following pipe materials:

1. Cast or ductile iron

2. Hot-dip galvanized steel

1.2 GENERAL

A. Contractor shall provide pipe supports, anchors, flexible couplings, and expansion joints for all piping systems. The Drawings indicate pipe supports, anchors, flexible couplings, and expansion joints for pipes larger than 12 inches in diameter, and in special cases for pipes that are 12 inches and smaller. Contractor shall design anchors, pipe supports, expansion joints, and flexible couplings not already shown on the Drawings, in accordance with the requirements specified herein.

B. Contractor’s design shall include pipe supports, bracing, and anchorage adjacent to expansion joints, couplings, valves, in-line devices, equipment, wyes and tees, or changes in direction as required for dismantling piping, removing valves or other in-line devices, disconnecting piping from equipment, and pipe support, in addition to supports in accordance with the maximum spacing specified herein. The pipe support system design by Contractor shall rigidly support pipe so there is no visible movement or visible sagging between supports. The system shall comply with specified piping code requirements.

C. Contractor shall not delete or relocate the supports, expansion joints, or couplings indicated on the Drawings without written approval of Engineer.

D. Pipe supports and expansion joints are not required in buried piping, but concrete blocking or other suitable anchorage shall be provided as indicated on the Drawings or specified in other section.

E. General Equipment Stipulations

1. The General Equipment Stipulations shall apply to all supports furnished under this section. If requirements in this specification differ from those in the General Equipment Stipulations, the requirements specified herein shall take precedence.

1.3 SUBMITTALS

A. General Drawings and Data.

1. Complete data, catalog information, and drawings covering fabricated pipe supports, fabricated inserts, and stainless steel, galvanized, and copper-plated and plastic-coated pipe supports shall be submitted in accordance with the Submittals Procedures section.

B. Intended Use and Location Schedule.

1. Data shall include a listing of the intended use and general location of each item submitted.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Unless otherwise indicated, all pipe supports shall comply with ANSI/MSS SP-58 and MSS SP-69. Materials of construction for fabricated steel supports are covered in the Structural and Miscellaneous Metals section. All pipe support materials shall be packaged as necessary to ensure delivery in satisfactory condition.

B. Unless otherwise specified or indicated on the Drawings, pipe supports shall be fabricated of manufacturer's standard materials and provided with manufacturer's standard finish.

C. Design loads for inserts, brackets, clamps, and other support items shall not exceed the manufacturer's recommended loads.

D. Pipe supports shall be manufactured for the sizes and types of pipe to which they are applied. Strap hangers will not be acceptable. Threaded rods shall have sufficient threading to permit the maximum adjustment available in the support item. Continuously threaded rod is not acceptable for hanger rods over 12 inches in length.

E. Unless accepted by Engineer, the use of supports which rely on stressed thermoplastic components to support the pipe will not be permitted.

F. Contact between dissimilar metals, including contact between stainless steel and carbon steel, shall be prevented. Portions of pipe supports which come into contact with other metals that are dissimilar shall be rubber or vinyl coated.

G. Hot-dip galvanized supports shall be in accordance with ASTM A153 and A385. Galvanized supports shall be provided in all locations.

H. Pipe support types and application shall comply with Table 1.

2.2 WIND AND SEISMIC LOADS

A. Not used.

PART 3 - EXECUTION

3.1 APPLICATION

A. Concrete inserts or anchor bolts shall be used to support piping from new cast-in-place concrete. Fastening of supports to existing concrete and masonry shall be in accordance with the Anchorage in Concrete and Masonry section.

B. Anchorage shall be provided to resist thrust due to temperature changes, changes in diameter or direction, or dead-ending. Anchors shall be located as specified to force expansion and contraction movement to occur at expansion joints, loops, or elbows, and as needed to prevent excessive bending stresses and opening of mechanical couplings. Anchorage for temperature changes shall be centered between elbows and mechanical joints used as expansion joints. Anchorage for bellows type expansion joints may be located adjacent to the joint.

C. Pipe supports for insulated cold piping systems shall be sized for the outside diameter of the insulated pipe, and an insulation protection shield shall be installed between the support and the insulation. Rigid insulation inserts shall be installed between the pipe and the insulation shields for piping larger than 2 inches or when needed to prevent crushing of the insulation. Inserts shall be of the same thickness as the adjacent insulation and shall be vapor sealed.

3.2 TYPES OF SUPPORTS

A. The products for pipe supports shall be as indicated in Table 1 for the specified type and size of support. Where stainless steel is specified for pipe supports but is not available from the name suppliers for the model specified in Table 1, Contractor shall provide a heavier duty support that is available in stainless steel.

TABLE 1 - TYPES OF SUPPORTS

Description and Service	MSS SP 69 Type (Note 1)	Specification
Hangers		
2-1/2 inch and smaller pipe		
For hot and cold insulated piping		

TABLE 1 - TYPES OF SUPPORTS

Description and Service	MSS SP 69 Type (Note 1)	Specification
Clevis	1	B-Line "B3100," Anvil "260" Piping Technology & Products Fig. 83.
Other services		
J-style	5	B-Line "B3690," Anvil "67," Unistrut "J Hanger," or Piping Technology & Products Fig. 67.
Clevis	1	B-Line "B3104," Anvil "260," or Piping Technology & Products Fig. 83.
3 Through 12 inch pipe (Note 3)		
For hot insulated piping		
Double bolt	3	B-Line "B3144," Anvil "295," or Piping Technology & Products Fig. 70.
For cold insulated piping		
Clevis	1	B-Line "B3100," Anvil "260," or Piping Technology & Products Fig. 83.
For uninsulated cold piping		
Clamp	4	B-Line "3140," Anvil "212," or Piping Technology & Products Fig. 50.
Clevis	1	B-Line "B3100," Anvil "260," or Piping Technology & Products Fig. 83.
Other services		
Clevis	1	B-Line "B3100" or Anvil "260" for steel pipe; B-Line "B3102," Anvil "590," or Piping Technology & Products Fig. 83 C. L. for cast iron pipe.
Concrete Inserts, Steel		

TABLE 1 - TYPES OF SUPPORTS

Description and Service	MSS SP 69 Type (Note 1)	Specification
12 inch and smaller pipe	18	Channel 12 ga , galv, 1-5/8 by 1-3/8 inches , min. 8 inches 200 mm long, anchor lugs on 4 inch centers, at least three lugs, end caps, and filler strip.
Side Beam Bracket	34	B-Line "B3062," Anvil "202," or Piping Technology & Products Fig. 20L.
Wall Supports and Frames, Steel, 12 inch and smaller pipe (Note 2)		
Brackets	32	B-Line "B3066," Anvil "195," or Piping Technology & Products Fig. 76.
	33	B-Line "B3067," Anvil "199," or Piping Technology & Products Fig. 76.
Prefabricated channels	--	12 ga , galv, 1-5/8 inches , with suitable brackets and pipe clamps.
Offset pipe clamp, 1-1/2 inch and smaller pipe	--	Galv, 1-1/4 by 3/16 inch steel, with 3/8 inch bolts.
Offset pipe clamp, 2 to 3-1/2 inch pipe	--	Galv, 1-1/4 by 1/4 inch steel, with 3/8 inch bolts.
Floor Supports, Steel or Cast Iron		
6 inch and smaller pipe	37 (with base)	B-Line "B3090," Anvil "259" or Piping Technology & Products Fig. 48.
8 through 12 inch pipe	38	B-Line "B3093," Anvil "264" or Piping Technology & Products Fig. 46.
Pipe Alignment Guides	--	B-Line "B3281" through "B3287," Anvil "255," or Piping Technology & Products Fig. 6.
Turnbuckles Steel	13	B-Line "B3202," Anvil "230," or Piping Technology & Products Fig. 30.

TABLE 1 - TYPES OF SUPPORTS

Description and Service	MSS SP 69 Type (Note 1)	Specification
Hanger Rods, Carbon Steel, Threaded Both Ends, 3/8 inch minimum size	--	B-Line "B3205," Anvil "140," or Piping Technology & Products Fig. 128.
Weldless Eye Nut, steel	17	B-Line "B3200," Anvil "290," or Piping Technology & Products Fig. 40.

Table 1 Notes:

1. MSS SP-69 supports and hangers are illustrated on Figure 1-15140.
2. Pipe clamps or other devices which rely on the application of a clamping force to the supported pipe in order to maintain the clamp position or location in a prefabricated channel or track will not be acceptable for use with nonmetallic pipe or tubing.
3. Alternatively, pipe hangers for 12 inch pipe may be saddle type as indicated on the Drawings.

3.3 SUPPORT SPACINGS

A. Pipe supports and expansion joints shall be spaced in accordance with Tables 2. The types of pipes to be supported are as specified herein. Table 2 covers spacings for the standard operating conditions specified for each pipe material. Spacing in the tables is the maximum spacing considering gravity loads. Where Contractor's design includes lateral and longitudinal forces due to seismic loads, wind loads, and other forces, the spacing requirement may be less than that indicated in the tables.

TABLE 2 – MAXIMUM PIPE SUPPORT SPACING AT STANDARD TEMPERATURES AND SERVICES

Type of Pipe	Pipe Support Max Spacing	Max Run Without Expansion Joint, Loop, or Bend (Note 1)	Expansion Joint Max Spacing (Note 2)	Type of Expansion Joints
	feet	feet	feet	
Cast iron or Ductile iron	15	80	80	Note 6
Steel, for hot water heating				
1-1/4 inch and smaller	7	30	100	Note 3

TABLE 2 – MAXIMUM PIPE SUPPORT SPACING AT STANDARD TEMPERATURES AND SERVICES

Type of Pipe	Pipe Support Max Spacing feet	Max Run Without Expansion Joint, Loop, or Bend (Note 1) feet	Expansion Joint Max Spacing (Note 2) feet	Type of Expansion Joints
1-1/2 to 4 inch	10	30	100	Note 3
Over 4 inch	15	30	100	Note 3

Table 2 Notes:

1. Unless otherwise acceptable to Engineer, an expansion joint shall be provided in each straight run of pipe having an overall length between loops or bends exceeding the maximum run specified herein.
2. Unless otherwise acceptable to Engineer, the spacing between expansion joints in any straight pipe run shall not exceed the maximum spacing specified herein.
3. Expansion joint fittings are specified in the respective piping sections.
4. At least two properly padded supports for each pipe section.
5. At least one support for each pipe section.
6. Expansion joints shall be mechanical couplings.
7. No expansion joints are required.
8. Supports for 5 and 10 foot long pipe sections shall be located within 18 inches of each joint. Supports shall be positioned to maintain the piping alignment and to prevent the piping from sagging.
9.

3.4 INSTALLATION

A. General

1. All piping shall be supported in a manner which will prevent undue stress on any valve, fitting, or piece of equipment. In addition, pipe supports shall be provided at changes in direction or elevation, and adjacent to flexible couplings. Pipe supports and hangers shall not be installed in equipment access areas.

2. Where horizontal piping is arranged with two or more parallel lines, trapeze hangers may be used in lieu of individual hangers. Trapeze assembly shall consist of structure attachments as previously specified with rod size dependent upon total weight supported. Spacing of assemblies shall be determined by the minimum pipe size included in the group supported. Trapeze horizontal assemblies shall be structural angle or channel section of sufficient size to prevent measurable sag between rods when pipes are full. All lines shall be attached to the horizontal with intermediate pipe guides and U-bolts or one-

hole clamps. Pre-engineered support equipment may be used when selected and installed in accordance with the manufacturer's recommendations.

3. Where copper pipe is installed on a support system of dissimilar metal with other pipes, the copper pipe shall be galvanically isolated from the support using Neoprene strips or other material acceptable to Engineer.

4. No piping shall be supported from the pipe above.

5. Horizontal piping hanger support rods shall attach to steel beams with center-loading I-clamps, or welded beam clips. Hanger support rods shall attach to concrete slabs or beams with inserts.

6. Anchorage shall be provided to resist both lateral and longitudinal seismic forces.

B. Inserts

1. Concrete inserts or anchor bolts shall be used to support piping from new cast-in-place concrete. Fastening of supports to existing concrete and masonry shall be in accordance with the Anchorage in Concrete and Masonry section. Reference building structural concrete Drawings for concrete inserts. When not provided as part of the building concrete structure, provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.

2. Where concrete slabs form finished ceilings, provide inserts flush with the slab surface.

3. Where inserts are omitted, drill through concrete slab from below and provide thru-bolt with recessed square steel plate and nut recessed into and grouted flush with slab. NDE (Non-Destructive Evaluation) shall be used to locate existing reinforcing before drilling.

C. Pipe Hangers and Supports

1. Install hangers to provide a minimum 1/2 inch space between finished covering and adjacent work.

2. A hanger shall be placed within 18 inches of each horizontal elbow, and on both sides of all piping accessories and valves weighing 20 lbs or more.

3. Hangers shall have 1-1/2 inches minimum vertical adjustment.

4. Support horizontal cast iron, ductile iron and no-hub piping systems adjacent to each joint.

5. Support vertical piping at every floor using riser clamps.

6. Support riser piping independently of connected horizontal piping.

7. Hanger and hanger components shall be sized specifically for the pipe size it is to be used on.

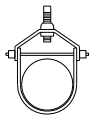
3.5 PLACEMENT

A. The maximum spacing for pipe supports and expansion joints shall be as indicated in Tables 2.

B. Rubber hose and flexible tubing shall be provided with continuous angle or channel support.

C. Unless otherwise indicated on the Drawings or acceptable to Engineer, piping shall be supported approximately 1-1/2 inches out from the face of walls and at least 3 inches below ceilings.

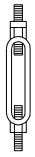
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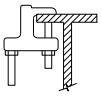
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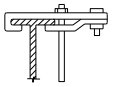
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BAND HGR
TYPE-7



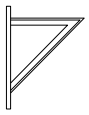
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TYPE-13



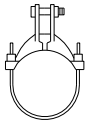
TOP BEAM
C-CLAMP
TYPE-19



TOP I-BEAM CLAMP
TYPE-25



LIGHT WELDED
STEEL BRACKET
TYPE-31



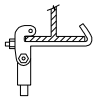
ALLOY STEEL
PIPE CLAMP
TYPE-2



EXTENSION PIPE ON
RISER CLAMP
TYPE-8



STEEL CLEVIS
TYPE-14



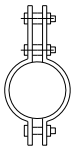
SIDE I-BEAM ON
CHANNEL CLAMP
TYPE-20



CLIP
TYPE-26

MEDIUM WELDED
STEEL BRACKET
TYPE-32

HEAVY WELDED
STEEL BRACKET
TYPE-33



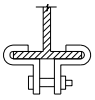
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STEEL DOUBLE BOLT
PIPE CLAMP
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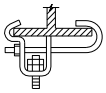
ADJUSTABLE
BAND HGR
TYPE-9



SWIVEL
TURNBUCKLE
TYPE-15



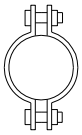
CENTER I-BEAM
TYPE-21



SIDE I-BEAM CLAMP
TYPE-27



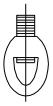
SIDE BEAM BRACKET
TYPE-34



STEEL PIPE CLAMP
TYPE-4



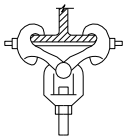
ADJ. SWIVEL RING
BAND TYPE
TYPE-10



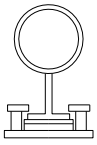
MALLEABLE
IRON SOCKET
TYPE-16



WELDED
ATTATCHMENT
TYPE-22
AS SHOWN OR
INVERTED LESS BOLT



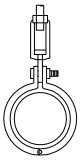
STEEL I-BEAM CLAMP
W/ EYE NUT
TYPE-28



PIPE SLIDE &
SLIDE PLATE
TYPE-35



PIPE HANGER
TYPE-5



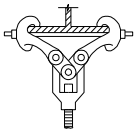
SPLIT PIPE W/WO
TURMBUCKLE ADJ.
TYPE-11



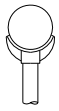
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EYE NUT
TYPE-17



C-CLAMP
TYPE-23



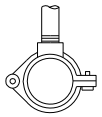
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W/ EYE NUT
TYPE-29



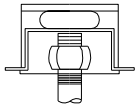
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SUPPORT
TYPE-36



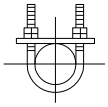
ADJ. SWIVEL PIPE RING
SPLIT RING TYPE OR
SOLID RING TYPE
TYPE-6



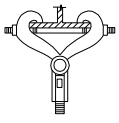
EXTENSION SPLIT
PIPE CLAMP
HINGED OR TWO BOLT
TYPE-12



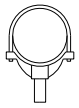
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CONCRETE INSERT
TYPE-18



U-BOLT
TYPE-24



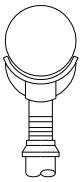
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W/EXTENSION PIECE
TYPE-30



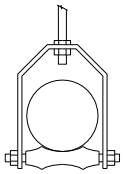
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SADDLE
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HANGERS AND SUPPORTS

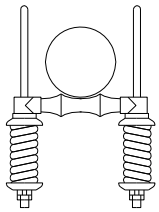
Black & Veatch	PIPE SUPPORTS	FIG 1-15140(A)



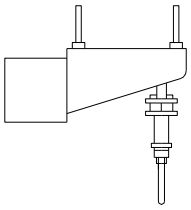
ADJUSTABLE PIPE
SADDLE SUPPORT
TYPE-38



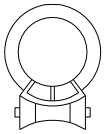
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HANGER W/WO SWIVEL
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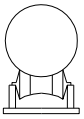
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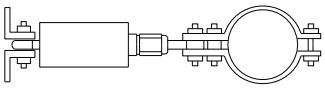
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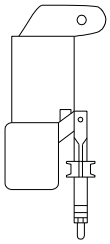
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PROTECTION SADDLE
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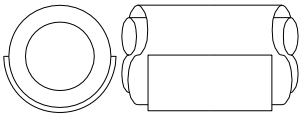
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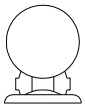
SPRING SWAY BRACE
TYPE-50



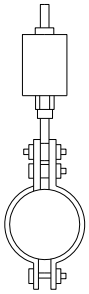
CONSTANT SUPPORT
VERTICAL TYPE
TYPE-55



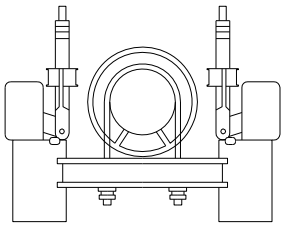
PROTECTION SHIELD
TYPE-40



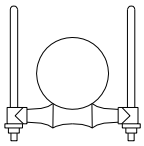
PIPE ROLL & PLATE
TYPE-45



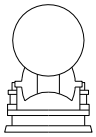
VARIABLE SPRING
HANGER
TYPE-51



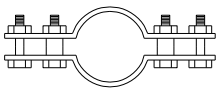
CONSTANT SUPPORT
TRAPEZE TYPE
TYPE-56



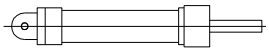
SINGLE PIPE ROLL
TYPE-41



ADJUSTABLE PIPE ROLL & BASE
TYPE-46



CARBON OR ALLOY STEEL
RISER CLAMP
TYPE-42



RESTRAINT CONTROL
DEVICE
TYPE-47



VARIABLE SPRING
BASE SUPPORT
TYPE-52

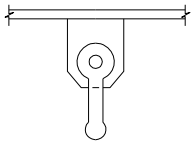
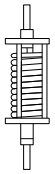
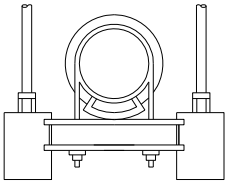


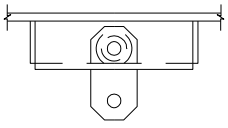
PLATE LUG
TYPE-57



SPRING CUSHION
TYPE-48



VARIABLE SPRING
TRAPEZE HANGER
TYPE-53



HORIZONTAL TRAVELER
TYPE-58

HANGERS AND SUPPORTS

Black & Veatch	PIPE SUPPORTS	FIG 1-15140(B)

SECTION 15180 - VALVE ACTUATORS

PART 1 - GENERAL

1.1 SCOPE

A. This section covers furnishing manual and powered valve actuators and accessories as specified herein.

1.2 GENERAL

A. Equipment provided under this section shall be fabricated and assembled in full conformity with Drawings, specifications, engineering data, instructions, and recommendations of the equipment manufacturer, unless exceptions are noted by Engineer.

B. Actuators shall be furnished with all necessary parts and accessories indicated on the Drawings, specified, or otherwise required for a complete, properly operating installation and shall be the latest standard products of a manufacturer regularly engaged in the production of actuators.

C. General Equipment Stipulations

1. The General Equipment Stipulations shall apply to all equipment furnished under this section. If requirements in this specification differ from those in the General Equipment Stipulations, the requirements specified herein shall take precedence.

D. Governing Standards

1. Except as modified or supplemented herein, electric motor actuators shall conform to applicable requirements of ANSI/AWWA C542.

2. Except as modified or supplemented herein, actuators for butterfly and eccentric plug valves shall conform to the applicable requirements of ANSI/AWWA C504.

E. Power Supply

1. Power supply to electric actuators will be as indicated in the valve schedules.

F. Marking

1. Each actuator shall be marked with the manufacturer's name, model number, and the country of origin. An identifying serial number shall be stamped on a corrosion-resistant plate attached to the actuator.

G. Temporary Number Plates

1. Each actuator shall be factory tagged or marked to identify the actuator and the applicable valve or gate by number or service as indicated in the valve or gate schedule.

1.3 SUBMITTALS

A. Drawings and Data General

1. Complete drawings, details, and specifications covering the actuators and their appurtenances shall be submitted in accordance with the Submittal Procedures section. Submittal drawings shall clearly indicate the country of origin of each actuator and its components.

B. Drawings and Data – Electrical and Wiring Diagrams

1. Submittal drawings shall include separate wiring diagrams for each electrically operated or controlled actuator and the electrical control equipment. Each actuator drawing shall be identified with the respective valve number or name.

C. Testing Certifications and Results.

1. For electric or cylinder actuators, certified copies of reports covering proof-of-design testing of the actuators as set forth in Section 5 of ANSI/AWWA C541 or ANSI/AWWA C542 respectively, together with an affidavit of compliance as indicated in Section 6.3 of ANSI/AWWA C541 or ANSI/AWWA C542 respectively, shall be submitted to Engineer before the actuators are shipped.

PART 2 - PRODUCTS

2.1 PERFORMANCE AND DESIGN REQUIREMENTS

A. General

1. Actuators and appurtenances shall be designed for the conditions and requirements as indicated in the respective valve and gate sections.

2. Liberal factors of safety shall be used throughout the design, especially in the design of parts subject to intermittent or alternating stresses. In general, working stresses shall not exceed one-third of the yield point or one-fifth of the ultimate strength of each material.

B. Valve Actuators

1. Each actuator shall be designed to open or close the valve under all operating conditions. Actuators shall be designed for the maximum pressure differential across the valve and maximum velocities through the valve where indicated in the respective valve schedules.

2. Valve actuators shall be provided and adjusted by the valve manufacturer. Actuator mounting arrangements and positions shall facilitate operation and maintenance and shall be determined by the valve manufacturer unless indicated otherwise on the Drawings or directed by Engineer.

3. When valves are to be buried, submerged, or installed in vaults; the actuators and accessories shall be sealed to prevent the entrance of water. The design water depth shall be as indicated in the respective valve schedules but not less than 20 feet .

2.2 MATERIALS

A. Except as modified or supplemented herein, materials used in the manufacture of actuators shall conform to the requirements of the applicable governing standard(s).

2.3 INTELLIGENT ELECTRIC ACTUATORS

A. General

1. Intelligent electric actuators as listed in the valve and gate schedules shall be provided by the valve or gate manufacturer.

2. Intelligent electric actuators for modulating service shall be Auma “AUMATIC AC SARBV 07.2 through SARBV 16.2” or Limitorque “MX” exception.

3. Intelligent electric actuators produced by other manufacturers are not acceptable.

4. Intelligent electric actuators shall be capable of non-intrusive configuration without requiring removal of any actuator covers. Configuration of actuator functions shall be by use of a hand held infrared linked device, laptop or PDA with compatible wireless communication capability, or by local control switches and 32-character LCD display mounted on the actuator housing. The display language shall be English .

5. Each intelligent electric actuator shall be furnished complete with a motor, gearing, handwheel, configurable output relays, torque sensors, lubricants, wiring, and terminals. Each actuator shall be constructed as a self-contained unit with a ductile iron or aluminum alloy housing, of a type as indicated in the valve and gate schedules, and shall be integrally assembled on the applicable valve or gate by the valve or gate manufacturer. Housings shall have two O-ring seals, one on the controls compartment and one on the terminal cover.

6. Actuators shall be designed to cycle the valve or gate from the fully open to the fully closed position or the reverse in approximately 60 seconds or as indicated in the valve and gate schedules.

7. Actuator motors may be mounted horizontally adjacent to or vertically above the reduction gearing. All gearing shall be oil or grease lubricated.

B. Motors

1. Motors shall be totally enclosed, high torque design made expressly for valve and gate actuator service, capable of operating the valve or gate under full differential pressure for two complete strokes or one complete cycle of travel without overheating. Motors shall be designed in accordance with NEMA standards and shall operate successfully at any voltage within 10 percent above or below rated voltage. Motor bearings shall be permanently lubricated. Motors shall be provided with stall, temperature, loss of phase, and reverse phase protection. Actuators shall be capable of indicating phase loss. Motors for open-close service shall be rated for a minimum of 60 starts per hour and motors for modulating service shall be rated for a minimum of 1,200 starts per hour.

C. Power Gearing

1. Power gearing shall consist of hardened steel spur or helical gears and alloy bronze or hardened steel worm gear, all suitably lubricated, designed for 100 percent overload, and effectively sealed against entrance of foreign matter. Steel gears shall be hardened to at least 350 Brinell. Planetary or cycloidal gearing, aluminum, mild steel, or nonmetallic gears will not be acceptable. Gearing shall be designed to be self-locking so that actuation of a torque switch or electronic torque protection device by a torque overload condition will not allow the actuator to restart until the torque overload has been eliminated. If a secondary gearbox is required, it shall be designed to withstand the locked rotor torque of the actuator.

D. Handwheel Mechanism

1. The handwheel shall not rotate during motor operation. During handwheel operation the motor shall not affect the actuator operation. The actuator shall be responsive to electrical power and control at all times and, when under electrical control, shall instantly disengage the handwheel. The handwheel shall rotate counterclockwise to open the valve. An arrow indicating the opening direction and the word "Open" shall be cast on the handwheel. The force required to operate the handwheel shall not exceed 80 lbs . The handwheel shall have a padlockable declutch lever.

E. Torque Sensing

1. Torque and thrust loads in both closing and opening directions shall be limited by a torque sensing device. Torque settings shall be adjustable and shall be indicated locally. The adjustment shall permit a variation of 40 to 100 percent of rated torque.

F. Terminal Facilities

1. Terminal facilities for connection to motor leads, switches, and control and indication signals shall be provided in a readily accessible terminal compartment. The terminal compartment shall have at least two openings for external electrical conduits, one sized at least 3/4 inch and the other at least 1-1/4 inches . Each terminal compartment shall be large enough to allow easy routing and termination of fifteen 12 AWG conductors.

G. Controls Compartment

1. Each actuator shall be furnished with a sealed compartment containing a reversing controller, multi tap transformer, electronic controls, and monitoring and protection modules. Reversing controllers shall be both mechanically and electrically interlocked and provided with the necessary direct-operated auxiliary contacts for required interlocking and control. The multi tap transformer shall provide power for all internal circuits, and shall provide 120 VAC supply for remote controls as indicated in the valve and gate schedules, or in the schematics on the Drawings.

H. Local Controls

1. Each actuator shall have controller devices mounted on the actuator as indicated in the valve and gate schedules.

I. Remote Indication and Controls

1. Valve or gate position and actuator status indication for non-networked valves shall be provided by four configurable output relay contacts which can be selected to indicate any position of the valve or gate. Relays shall be configurable to the normally open or normally closed states. Relays shall maintain and update position indication during handwheel operation. Contacts shall be rated 5 A, 250 VAC, 30 VDC. When not used for position indication, any of the four configurable relays shall be selectable to signal one of the following:

a. Thermostat tripped, phase loss.
b. Motor tripped on torque in mid travel, motor stalled.
c. Remote mode selected.
d. Local mode selected.

2.4 ACTUATOR ACCESSORIES

A. Extension Stems

1. Not used.

B. Position Indicators

1. Not used.

C. Floor Boxes

1. Not used.

D. Torque Tubes

1. Not used.

E. Valve Boxes

1. Not used.

2.5 SHOP PAINTING

A. All ferrous metal surfaces, except bearing and finished surfaces and stainless steel components of valve actuators and accessories, shall be shop painted for corrosion protection. The valve manufacturer's standard coating will be acceptable, provided it is functionally equivalent to the specified coating and is compatible with the specified field painting.

B. The following surfaces shall be painted:

Polished or Machined Surfaces	Rust-preventive compound.
Other Surfaces	Epoxy.
Actuators and Accessories	Universal primer.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Actuators will be installed on the valves in accordance with the Valve Installation section..

End of Section

SECTION 16050 - ELECTRICAL

PART 1 - GENERAL

1.1 SCOPE

A. This section covers the furnishing and installation of all equipment and materials needed for the electrical requirements of this Contract. It also covers conduit, wiring, and terminations for electrical equipment installed under Electrical Equipment Installation section.

B. This section covers the installation and interconnection of electrical equipment furnished under other sections, except electrical items designated to be installed under those sections.

C. This section covers installation of equipment furnished by Owner.

1.2 GENERAL

A. Electrical apparatus on all equipment shall be installed complete and placed in readiness for proper operation.

B. Electrical materials furnished and installed under this section shall be fabricated, assembled, erected, and placed in proper operating condition in full conformity with the Drawings, Specifications, engineering data, instructions, and recommendations of the equipment manufacturer, unless exceptions are noted by Engineer.

C. General Equipment Stipulations

1. The General Equipment Stipulations section shall apply to all equipment provided under this section. If requirements in this section differ from those in the General Equipment Stipulations section, the requirements specified herein shall take precedence

D. Seismic Design Requirements

1. Seismic design requirements for products specified herein shall be as indicated in the Meteorological and Seismic Design Criteria section.

E. Coordination

1. Electrical work shall conform to the construction schedule and the progress of other trades.

F. Anchor Bolts and Expansion Anchors

1. All anchor bolts, nuts, washers, and expansion anchors shall comply with Anchorage in Concrete and Masonry section, except smaller than 3/4 inch 19 mm will be permitted to match NEMA standard size bolt holes on motors and electrical equipment.

G. Drawings

1. Supplementing this section, the Drawings indicate locations of equipment and enclosures and provide one-line and schematic diagrams regarding the connection and interaction with other equipment.

1.3 CODES AND PERMITS

A. All work shall be performed and materials shall be furnished in accordance with the NEC - National Electrical Code, the NESC - National Electrical Safety Code, and the following standards where applicable:

AEIC	The Association of Edison Illuminating Companies
ANSI	American National Standards Institute
ASTM	American Society for Testing and Materials
AWG	American Wire Gauge
Fed Spec	Federal Specification
ICEA	Insulated Cable Engineers Association
IEEE	Institute of Electrical and Electronics Engineers
IESNA	Illuminating Engineering Society of North America
NEIS	National Electrical Installation Standards
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
UL	Underwriters' Laboratories

B. Equipment covered by this section shall be listed by UL, or by a nationally recognized third party testing laboratory. All costs associated with obtaining the listing shall be the responsibility of Contractor. If no third-party testing laboratory provides the required listing, an independent test shall be performed at Contractor’s expense. Before the test is conducted, Contractor shall submit a copy of the testing procedure to be used.

1.4 SEISMIC DESIGN REQUIREMENT.

A. Seismic Design Requirements

1. Submit confirmation of compliance with the requirements of the Meteorological and Seismic Design Criteria section.

1.5 IDENTIFICATION.

A. Conduit

1. Conduits in manholes, handholes, building entrance pull boxes, junction boxes, and equipment shall be provided with identification tags. Identification tags shall be 19 gage stainless steel, with 1/2 inch stamped letters and numbers as indicated on the Drawings. Identification tags shall be attached to conduits with nylon tie wraps and shall be positioned to be readily visible.

B. Conductors

1. All conductors in power, control, and instrumentation circuits shall be identified and color coded as described herein.

2. Conductor Identification Number

   a. Except for lighting and receptacle circuits, each individual conductor in power, control, and instrumentation circuits shall be provided with wire identification markers at the point of termination.
   b. The wire markers shall be of the heat-shrinkable tube type, with custom typed identification numbers.
   c. The wire numbers shall be as indicated on the equipment manufacturer's drawings.
   d. The wire markers shall be positioned to be readily visible for inspection.

3. Conductor Color Coding

   a. Power conductors shall be color coded as indicated below. For conductors 6 AWG and smaller, the color coding shall be the insulation finish color. For sizes larger than 6 AWG, the color coding may be by marking tape. The equipment grounding conductor shall be green or green with one or more yellow stripes if the conductor is insulated.
   b. The following color coding system shall be used:
      1) 120/240V single-phase — black, red, and white
      2) 120/208V, three-phase — black, red, blue, and white
      3) 120/240V, three-phase — black, orange, blue, and white
      4) 277/480V, three-phase — brown, orange, yellow, and gray
      5) 2400/4160V, three-phase — black, red, blue, and white
      6) 7200/12470V, three-phase — black, red, blue, and white

   c. Where 120/240 and 120/208 volt systems share the same conduit or enclosure, the neutral for either the 120/240 volt system or the 208 volt system shall be white with a permanent identifiable violet stripe.
   d. Control and instrumentation circuit conductors shall be color coded as indicated in the Cable Data Figures at the end of this section.

C. Motor Starters

1. Motor starters 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 black-over-white plastic, with 1/8 inch engraved letters, and shall be securely fastened to the motor starters.

D. Control Stations

1. 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 black-over-white plastic, with 1/8 inch engraved letters, and shall be securely fastened to the control stations.

E. Circuit Breakers

1. Circuit breakers shall be provided with nameplates identifying related equipment. Nameplates shall be laminated black-over-white plastic, with 1/8 inch engraved letters, and shall be securely fastened to the circuit breakers.

F. Disconnect Switches

1. All switches shall have front cover-mounted permanent nameplates that include switch type, manufacturer's name and catalog number, and horsepower rating. An additional nameplate, engraved or etched, laminated black-over-white plastic, with 1/8 inch letters, shall be provided to identify the associated equipment. Both nameplates shall be securely fastened to the enclosure.

G. Arc Flash Hazard Labels

1. Lighting panels, power panels, power centers, switchgear, switchboards, motor control centers, motor control line ups, transfer switches, industrial control panels, adjustable frequency drives, fused switches, meter socket enclosures, and other electrical equipment likely to be worked on energized shall be provided with permanent labels warning the risk of arc flash and shock hazard. Labels shall be designed in accordance with ANSI Z535.4 and shall include the following:

WARNING
Arc Flash and Shock Hazard

Appropriate personal protection equipment (PPE) required. SEE NFPA 70E. Equipment must be accessed by qualified personnel only.
Turn off all power sources prior to working on or inside equipment.

2. Additional information shall be provided on the labels where specified in the Arc Flash Hazard Analysis section of this section.

1.6 SUBMITTALS

A. Drawings and Data – General

1. Complete assembly, foundation, and installation drawings, together with complete engineering data covering the materials used, parts, devices, and accessories forming a part of the work performed by the Contractor, shall be submitted in accordance with the

Submittal Procedures section. The drawings and data shall include, but shall not be limited to, the following:

a. Drawings and data.
b. Operating manuals.
c. Samples.
d. Test reports
e. Studies.

B. Submittal Details & Identification

1. Information covering all materials and equipment shall be submitted for review in accordance with the Submittal Procedures section. Each sheet of descriptive literature submitted shall be clearly marked to identify the material or equipment as follows:

a. Lamp fixture descriptive sheets shall show the fixture schedule letter, number, or symbol for which the sheet applies.
b. Equipment and materials descriptive literature and drawings shall show the specification paragraph for which the equipment applies.
c. Sheets or drawings covering more than the item being considered shall have all inapplicable information crossed out.
d. A suitable notation shall identify equipment and materials descriptive literature not readily cross-referenced with the Drawings or Specifications.
e. Schematics and connection diagrams for all electrical equipment shall be submitted for review. A manufacturer's standard connection diagram or schematic showing more than one scheme of connection will not be accepted, unless it is clearly marked to show the intended connections.
f. Surge protective device submittals shall include drawings (including unit dimensions, weights, component and connection locations, mounting provisions, and wiring diagrams), equipment manuals that detail the installation, operation and maintenance instructions for the specified unit(s), and manufacturer’s descriptive bulletins and product sheets.

C. Engineering and Testing Firm

1. Contractor shall submit the name and qualifications of the Engineering and Testing Services firm proposed to perform the protective device study and the on-site testing.

D. Cable and Conduit Submittal

1. Within 90 days after the Notice to Proceed, Contractor shall furnish a submittal for all types of cable and conduit to be provided. The submittal shall include the cable manufacturer and type, and sufficient data to indicate that the cable and conduit meet the specified requirements.

E. Cable Samples

1. In addition to the complete specifications and descriptive literature, a sample of the largest size of each type of cable shall be submitted for review before installation. Each sample shall include legible and complete surface printing of the cable identification.

F. Seismic Design Requirements

1. Submitted confirmation of compliance with the requirements of the Meteorological and Seismic Design Criteria section.

1.7 PROTECTION AND STORAGE

A. During construction, the insulation on all electrical equipment shall be protected against absorption of moisture, and metallic components shall be protected against corrosion by strip heaters, lamps, or other suitable means. This protection shall be provided immediately upon receipt of the equipment and shall be maintained continuously.

PART 2 - PRODUCTS

2.1 POWER SERVICE ENTRANCE

A. Contractor shall consult the local electric utility regarding their service installation requirements, and shall furnish the service equipment in compliance with these requirements.

B. Power service equipment to be furnished by Contractor shall include, but is not limited to, meter socket, meter transformer cabinet, disconnecting means, grounding materials, riser conduits, and other service entrance fittings required by the utility and for compliance with local codes and regulations.

C. Contractor shall also provide trenching and backfill, conduits, concrete for duct banks, transformer pads, and other underground service entrance fittings required by the utility for underground service installation.

2.2 CABLE

A. All cables of each type (such as lighting cable or 600 volt power cable) shall be from the same manufacturer.

B. All types of cable shall conform to the Cable Data Figures at the end of this section and as described herein.

C. Lighting Cable

1. Lighting cable (Figure 1-16050 THHN-THWN) shall be provided only in lighting and receptacle circuits operating at 277 volts or less. Lighting and receptacle circuits, 8 AWG or larger, shall be as specified for 600 volt (Figure2-16050 XHHW-2) power cable.

D. 600 Volt Power Cable

1. Cable in power, control, indication, and alarm circuits operating at 600 volts or less, except where lighting, multiconductor control, and instrument cables are required, shall be 600 volt (Figure 2-16050 XHHW-2) power cable.

E. Instrument Cable

1. Cable for electronic circuits to instrumentation, metering, and other signaling and control equipment shall be two- or three-conductor instrument cable twisted for magnetic noise rejection and protected from electrostatic noise by a total coverage shield. Types of instrument cables shall be (Figure 4-16050 single pair), (Figure 5-16050 single triad), or (Figure 6-16050 multiple pair and/or triad).

F. Multiconductor Control Cable

1. When indicated on the Drawings, cable in control, indication and alarm circuits shall be multiconductor. Cable shall be (Figure 7-16050 14 AWG THHN-THWN) or (Figure 8-16050 12 AWG THHN-THWN).

G. Medium Voltage Power Cable

1. Cable for circuits rated higher than 600 volts but not above 5,000 volts, and for wet or dry locations in conduit and open air, shall be (Figure 9-16050 8 kV EPR) power cable.

2. Cable for circuits rated higher than 5,000 volts but not above 15,000 volts, and for wet or dry locations in conduit and open air, shall be (Figure 10-16050 15 kV EPR) power cable.

H. Tray Cable

1. When required on projects using electrical trays as raceways, cable shall be (Figure 11-16050 3 conductor XLP-PVC) or (Figure 12-16050 single conductor XHHW-2) tray cable. Power cable to equipment controlled by an adjustable frequency drive operating at 600 volts or less, shall be 2000 volt (Figure 15-16050) multiconductor power cable.

2.3 RACEWAY

A. Conduit and cable tray shall be as described in the following paragraphs:

B. Liquidtight Flexible Metal Conduit

1. Liquidtight flexible metal conduit shall be hot-dip galvanized steel, shall be covered with a moistureproof polyvinyl chloride jacket, and shall be UL labeled.

C. Utility (PVC) Duct

1. Utility duct with concrete encasement shall be polyvinyl chloride (ASTM F-512 designation DB-120) and shall conform to NEMA TC-6, NEMA TC-8, and ASTM F-512.

D. Rigid Nonmetallic (PVC) Conduit

1. PVC conduit shall be heavy wall, Schedule 40 and 80, UL labeled for aboveground and underground uses, and shall conform to NEMA TC-2 and UL 651.

E. Rigid Aluminum Conduit (RAC)

1. Rigid aluminum conduit and fittings shall be manufactured of 6063-T1 alloy, shall conform to ANSI C80.5, and shall be manufactured in accordance with UL 6A.

F. Reinforced Thermosetting Resin Conduit (RTRC)

1. Reinforced thermosetting resin conduit shall be manufactured of low-halogen resin with standard wall thickness in accordance with UL 2515.

G. Cable Tray

1. Cable tray shall be aluminum constructed of AA-6063-T6 alloy. Electrical cable tray shall be in accordance with the requirements of NEMA VE 1. Cable trays shall be trough or ladder type construction as shown on the Drawings and/or as specified herein. Trough type tray shall be constructed with support provided over a minimum of 50 percent of its length for cable laid anywhere in the cable tray. Ladder type tray shall have a center-to-center rung spacing of 6 inches. Bolts, nuts, and pins for aluminum cable tray systems shall be 302, 304, or 316 stainless steel. All other hardware and accessories shall be of the same material as the tray.

2. All outdoor cable tray shall have solid aluminum covers with clamps.

3. The cable tray shall be capable of supporting loads as defined by NEMA VE 1 for load span class designations without failure or permanent distortion plus an additional 200 pound concentrated load placed at the mid-span of either side rail. The maximum longitudinal simple beam deflection for all cable trays shall be 0.35 inch at mid-span between 8 foot supports. The cable tray shall have the following NEMA VE 1 load span class designations.

Cable Tray Size	NEMA Class
4 x 12	12B
6 x 12	12B
4 x 18	12B
6 x 18	12B
4 x 24	12C
6 x 24	12C
4 x 36	12C

4. The cable tray load factor (safety factor) shall be 1.5 in regard to destruction load tests in accordance with the requirements of NEMA VE 1 for the load span class designations

noted above. This means that the destruction capacity of the tray furnished shall be 1.5 times the loading as listed in NEMA VE 1 for load span class designations for the various cable tray widths.

2.4 WIRING DEVICES, BOXES, AND FITTINGS

A. Concealed conduit systems shall have flush-mounted switches and convenience outlets. Exposed conduit systems shall have surface-mounted switches and convenience outlets.

B. Conduit Boxes and Fittings

1. Aluminum boxes and fittings shall be manufactured by Crouse-Hinds, Appleton, or O Z Gedney shall be installed.

2. Rigid PVC device boxes and fittings shall be manufactured by Carlon or Cantex.

3. Hub arrangements on threaded fittings shall be the most appropriate for the conduit arrangement to avoid unnecessary bends and fittings.

C. Device Plates.

1. Device plates on flush mounted outlet boxes where weatherproof plates are not required shall be AISI Type 302 stainless steel, Eaton "93000 series", Hubbell "S series", or Leviton "840nn-40 series"; nylon or polycarbonate, Eaton "5000 series", Hubbell "Pn series", or Leviton "807nn-I series".

2. Device plate mounting hardware shall be countersunk and finished to match the plate.

3. Device plates for switches outdoors or indicated as weatherproof shall have provisions for padlocking switches "On" and "Off", and shall be Appleton "FSK-1VS", Crouse-Hinds "DS185" or O Z Gedney "FS-1-WSCA".

~~4.~~ Device plates for receptacles indicated as weatherproof shall be Appleton "FSK-WRD", Crouse-Hinds "WLRD1", or O Z Gedney "FS-1-WDCA.

5. Flush-mounted, weatherproof plates shall be provided with adapter plates, Appleton "FSK-SBA" or Crouse-Hinds "FS031".

6. Device plates for ground fault interrupter receptacles indicated to be weatherproof shall be Appleton "FSK-WGFI", Eaton "S966", or O Z Gedney "FS-1-GFCA".

7. Receptacle covers outdoors or otherwise indicated to be weatherproof while in-use shall be die cast aluminum and shall include a padlock eye. Covers for standard convenience outlets shall be Hubbell “WP8M” or Thomas and Betts Red Dot “CKMUV”. Covers for ground fault interrupter receptacles shall be Hubbell “WP26M” or Thomas and Betts Red Dot “CKMUV”.

8. Engraved device plates, where required, shall be manufactured by Leviton, or equal.

9. Device plates on PVC conduit fittings shall be Carlon "E98 Series" or Cantex "513300 Series".

D. Wall Switches

1. Switches on ac lighting panel load circuits through 277 volts shall be 20 amperes, 120/277 volts, Eaton "AH1221V" through "AH1224V", Hubbell "HBL 1221I" through "HBL 1224I", or Leviton "1221-2I" through "1224-2I".

2. Switches for pulse control of lighting contactors shall be 20 amperes, 120/277 volts, momentary, double-throw, center "Off", Eaton "1995V", Hubbell "1557I" or Leviton "1257-I".

3. Switches on ac lighting panel load circuits through 277 volts in Class I, Division 1 and Division 2, Group D hazardous areas indicated on the Drawings shall be 20 ampere, 120/277 volts. Hazardous area switches shall be factory sealed tumbler switches, Appleton “EDS” or Killark “FXS”.

E. Receptacles

1. Standard convenience outlets shall be duplex, three-wire, grounding, 20 amperes, 125 volts, Eaton "AH5362V", Hubbell "5362I" or Leviton "5362-I" for 120 volt circuits, and 250 volts, Eaton "AH5462CV", Hubbell "5462I" or Leviton "5462-I" for 240 volt circuits.

~~2.~~ Ground fault circuit interrupter receptacles shall be duplex, 20 amperes, 125 volts, Eaton "SGFH20", Hubbell "GFRST20I" or Leviton "G5362-I".

3. Ground fault circuit interrupter receptacles in damp or wet locations shall be duplex, 20 amperes, 125 volts, Hubbell "GFWRST20I" or Leviton "G5362-WTI".

~~4.~~ 600 volt welding receptacles shall be 30 amperes, 3 phase, with grounding conductors connected through a fourth pole, Appleton "ADRE3034-100", Crouse-Hinds "AR348" plus "ARRC33" and "AR30" or Leviton " 430MI5W". One matching plug, Appleton "ACP3034BC", Crouse-Hinds "APJ3485" or Leviton "430P5W" with appropriate woven grip and plug cap, shall be furnished for the cable size directed by Owner.

5. 240 volt welding receptacles shall be 60 amperes, 3 phase, with grounding conductors connected through a fourth pole, Appleton "ADRE6034-150", Crouse-Hinds "AREA6425" or Leviton "460MI9W". One matching plug, Appleton "ACP6034BC", Crouse-Hinds "APJ6485" or Leviton "460P9W" with appropriate woven grip and plug cap, shall be furnished for the cable size directed by Owner.

6. Receptacles in Class I, Division 1 and Division 2, Group D hazardous areas indicated on the Drawings shall be three-wire, grounding, 20 amperes, 125 volts. Hazardous area receptacles shall be factory sealed, with an integral switch that is only activated when an approved matching plug is fully inserted and rotated into the engaged position. Hazardous area receptacles shall be Appleton “ENR”, Crouse-Hinds “ENR”, or Killark “UGR”.

F. Special Outlets

1. Clock outlets shall be Hubbell "5235" or Leviton "5261-CH".

2.5 JUNCTION BOXES, PULL BOXES, AND WIRING GUTTERS

A. Boxes and gutters shall be NEMA Type 4X, thermoplastic polymer or stainless steel and shall be rigidly supported by PVC-coated or stainless steel framing materials. Mounting hardware, which includes nuts, bolts, and anchors, shall be stainless steel. All damaged coatings shall be repaired according to the manufacturer's instructions.

B. Bolt-on junction box covers 3 feet square or larger, or heavier than 25 lbs, shall have rigid handles. Covers larger than 3 by 4 feet shall be split.

C. Where indicated on the Drawings, junction and pull boxes with a removable side opposite the underground conduits shall be provided over building ends of underground conduit banks. Boxes shall be sized in accordance with the National Electrical Code, including space for full size continuations of all underground conduits not originally continued. Conduit arrangement shall leave maximum space for future conduits.

2.6 SUBMERSIBLE JUNCTION BOXES

A. Submersible Boxes shall be NEMA Type 6P rated for submersion to at least 30 feet, constructed of stainless steel, and be rigidly supported by stainless-steel framing materials. Mounting hardware, which includes nuts, bolts, and anchors, shall be stainless steel.

B. Junction box covers shall be bolt-on.

C. Cable entrances shall have welded in-place hubs with an NPT female connections.

D. Cable glands shall have NPT male hub connection, be rated for submersion to at least 30 feet, be constructed of stainless steel, and be sized and rated for use with provided cords and cables.

1. Non-Armored Cable for locations where cable is not subject to substantial physical damage: Glands shall include double cable seals providing 100% of cable clamping.

2. Flexible and Rigid Conduit: Glands shall include cable seal and conduit connection.

E. Boxes shall be sized in accordance with the National Electrical Code.

2.7 LIGHTING PANELS

A. Each lighting panel shall be a dead-front, 120/240 volt, single phase or 120/208 volt, three phase panelboard with circuit breakers, in accordance with the Drawings and the following:

B. Cabinet

1. The panel shall have a flush-mounted or surface-mounted enclosure with a NEMA designation appropriate for the location where it will be installed. The enclosure shall have a hinged trim (cover). Breaker operating handles shall be accessible through a latched, lockable, door. At the completion of the Contract, a neatly printed or typed directory listing the panel and circuit identities shall be mounted inside the door.

C. Circuit Breakers

1. Circuit breakers shall be thermal magnetic, bolt in, individually front replaceable, and shall indicate "On", "Off", and "Tripped". Breakers indicated as multiple-pole shall be common trip. Breakers shall have interrupting ratings not less than scheduled rating of panel nor less than 22,000 amperes. Handle clips to prevent casual operation of breakers shall be provided for 10 percent (at least two) of the breakers and applied to the circuits directed. Breakers and provisions for future breakers shall be provided in the quantities, number of poles, and ampere ratings indicated on the Drawings.

2. Where indicated on the Drawings, circuit breakers shall include arc-fault circuit interrupter (AFCI) and/or ground fault circuit interrupter (GFCI) protection functions. Where GFCI breakers dedicated to protect heat tracing circuits, GFCI breakers shall be configured for equipment protection with a ground fault trip threshold of 30 mA. Otherwise, GFCI breakers shall be configured for personnel protection with a ground fault trip threshold of 5 mA.

D. Buses

1. The panel shall have main and neutral buses insulated from the cabinet, and a ground bus. Buses shall be copper, with ampere ratings and main lugs or breaker as indicated. The ground bus shall be similar to a neutral bus and shall have a good ground connection to the cabinet, a removable bond to the neutral bus, clamp type lugs for the ground cable in each supply conduit, and connections for a ground cable in each load conduit.

2.8 CONTROL STATIONS

A. Control stations shall be provided as indicated on the one-line diagrams or schematics or as required by the equipment furnished. Pilot devices shall be 30.5 mm heavy-duty, oiltight construction, and shall perform the functions indicated. Pilot lights shall be full voltage type with LED lamps. Indoor control stations shall have NEMA Type 13 enclosures. Control stations outdoors or indicated to be weatherproof shall have NEMA Type 4X stainless steel enclosures with protective caps on the control devices. Control stations in NEC Class I, Division 1 and Division 2, Group D hazardous areas shall have NEMA Type 7 enclosures, or be factory sealed type, Appleton “Contender Series” or Killark “Seal-X Series”.

B. Emergency Break-Glass Switch

1. Each break-glass switch for HVAC emergency shutoff shall be furnished with a NEMA enclosure as specified herein with hammer, hammer clip, and chain. Each switch shall be Eaton "10250TGS" or Schneider-Electric "Type 9001K15" with one normally open and one normally closed contact block, or equal. Five spare glass disks shall be furnished for

each switch. When the glass disk is broken with the hammer, the button will return to a normal extended position.

2.9 RELAY ENCLOSURES

A. Relay enclosures shall be furnished as indicated on the Drawings. The enclosure shall have a NEMA designation appropriate for the location where it will be installed. Pilot devices shall be heavy duty, oiltight construction. Relays and timers shall have 120 volt, 60 Hz coils rated for continuous duty in 40 C ambient and 10 ampere, 120 volt ac contacts. Intrinsically safe relays shall be installed within the enclosures in accordance with NEC requirements and shall be Gems "Safe-Pak", B/W "Series 53", or equal.

2.10 ALARM HORN AND BEACON

A. The alarm horns and beacons shall be provided and located as indicated on the Drawings. The beacon shall be 120 VAC, strobe light with clear lens and acrylic dome, Edwards "Model No. 94C-N5" or Federal Signal "Model 371DST". The alarm horn shall be 120 VAC, weatherproof horn, Edwards "Model No. 876-N5" or Federal Signal "Model 350WB". In Class 1, Division 1 and Division 2, group D hazardous areas as indicated on the Drawings the beacon shall be 120 VAC, strobe light with clear lens and acrylic dome, Edwards “Model 116EXMSTC-N5“ or Federal Signal “Model 27XST”. In Class 1, Division 1 and Division 2, group D hazardous areas as indicated on the Drawings the alarm horn shall be 120 VAC, weatherproof horn, Edwards “Model 878EX-N5” or Federal Signal “Model 31X.

2.11 DOOR ENTRY SWITCHES

A. Door entry switches shall be provided as indicated on the Drawings and as specified herein. Switches shall be heavy-duty industrial, adjustable, magnetic wide gap type. Switch and magnet housings located in NEC Class I, Division 1 and 2, Group D hazardous areas shall be die-cast aluminum, explosionproof, Sentrol "2800T Series", Simplex "Model 2760-9077", or equal. Switch and magnet housings located in other areas shall be anodized aluminum, Sentrol "2500 Series" Simplex "Model 2760-9082", or equal.

PART 3 - EXECUTION

3.1 INSTALLATION, TESTING, AND COMMISSIONING

A. All material, equipment, and components specified herein shall be installed, tested, and commissioned for operation in compliance with NECA 1000 – NEIS Specification System. Where required in NECA 1000, testing and commissioning procedures shall be followed prior to energizing equipment.

3.2 ARC FLASH HAZARD ANALYSIS

A. Contractor shall commission an Arc Flash Hazard Analysis in accordance with OSHA 29 CFR Part 1910, NEC, NFPA 70E, and IEEE 1584 and shall submit an Arc Flash Hazard Analysis report as specified hereing. The scope of the analysis shall include arc flash labeling for each piece of electrical equipment including lighting panels, power panels, power centers, switchgear, switchboards, motor control centers, motor control line ups, transfer switches, industrial control panels, adjustable frequency drives, fused switches, meter sockets, medium-voltage transformers, and other electrical equipment likely to be worked on energized

B. The scope of the analysis shall include all new or modified electrical equipment and any equipment who's incident energy is impacted as a result of the design. Contractor shall request the existing arc flash analysis and computer model files, from the Owner and modify the existing model as required to perform the analysis. The Contractor shall field verify the existing computer model data and update as required.The analysis shall calculate the incident energy value and arc flash boundary at defined working distances for all AC, three-phase, 208 volt through 15kV, electrical equipment in accordance with the IEEE 1584 calculation method.

C. AC single-phase equipment, rated 208 volt and above, shall be calculated using single-phase fault current values applied to the three-phase equations in accordance with IEEE 1584.

D. AC single-phase equipment, rated below 208 volt, with a maximum available fault current of 25 kA and a maximum fault clearing time of 2 cycles, shall be analyzed and labelled using the Arc-Flash PPE Categories for Alternating Current Systems, Table 130.7(C)(15)(a), in NFPA 70E (2018).

E. DC system and equipment shall be analyzed and labelled using the Arc-Flash PPE Categories for Direct Current Systems, Table 130.7(C)(15)(b), in NFPA 70E (2018).

F. The Arc Flash Hazard Analysis shall be performed in association with, or as a continuation of, the short circuit study and protective device study. Protective-device settings shall be selected to provide the necessary equipment protection and device coordination required while balancing the goal to reduce the calculated incident energy to the greatest extent possible.

G. The analysis shall be performed for multiple electrical system modes of operation in order to calculate the worst-case incident energy at each piece of equipment. At a minimum, the system shall be analyzed for the minimum and maximum available fault current and X/R ratios from the electric utility supplying service or for the separately derived power system. The Contractor shall be responsible for obtaining the available fault current values from the local electric utility. The analysis shall not assume bolted fault current values.

H. For equipment with an integral main overcurrent protective device that is not adequately isolated from the bus, the upstream protective device shall be used as the fault clearing device in the analysis. Where arc reduction maintenance mode switches are installed on protective devices, the arc reduction shall only apply for downstream equipment that is adequately isolated from the protective device. Adequately isolated equipment shall be confirmed by the equipment manufacturer and shall be submitted to Engineer for review.

I. The Contractor shall be responsible for collecting all field data for a complete analysis. Assumptions should only be made after every effort has been made to obtain the needed information. All assumptions used in the analysis shall be documented in the report for review by Engineer.

J. The results shall include, but shall not be limited to, a tabulated spreadsheet of the following items for each piece of equipment included in the analysis:

1. Equipment name.

2. Three-phase bolted fault current.

3. Arcing fault current.

4. Arcing fault current through the protective device.

5. Protective device clearing the fault.

6. Protective device opening time.

7. Bus gap.

8. Worst-case incident energy and corresponding working distance. Equipment with arc reduction maintenance mode switches shall include the calculated incident energy level with and without the switch enabled.

9. Arc flash protection boundary.

K. An Engineering and Testing Services firm acceptable to Engineer shall conduct the Arc Flash Hazard Analysis.

L. Arc Flash Analysis Software

1. The Arc Flash Hazard Analysis shall be performed using the latest version of SKM Powertools electrical power system analysis software, without exception. After the final version of the study and analysis are completed and accepted, Contractor shall provide a copy of the electronic computer model files to Owner.

M. Arc Flash Hazard Report.

1. Contractor shall be responsible for submitting complete and accurate arc flash analysis information in the Arc Flash Hazard Report. The report shall be submitted to Engineer for review before the final report is prepared.

2. The report shall include the following information at a minimum:

a. Executive summary.
b. Description of scope and study methodology.

c. Documentation of the modes of operation evaluated in the analysis including applicable input data such as utility fault current values.
d. Discussion of results and any recommendations.
e. Tabulated results spreadsheet.
f. List of assumptions.
g. One-line diagram(s) from the computer model software showing equipment names and other applicable information.
h. Documentation of software study parameters and configuration settings.
i. Recommended arc flash Personal Protective Equipment (PPE) selection in accordance with NFPA 70E.

3. A bound hardcopy and digital PDF of the final Arc Flash Hazard Analysis report shall be submitted in accordance with the Submittal section.

4. The final report shall be signed and sealed by a registered Professional Engineer.

N. Arc Flash Labeling

1. After approval of the Arc Flash Hazard Report, Contractor shall furnish and install arc flash labels on the applicable electrical equipment. The label template shall be subject to review and acceptance by Engineer. The arc flash labels shall comply with ANSI Z535.4 and NFPA 70E requirements. Labels shall include, at a minimum, the nominal system voltage, the arc flash boundary distance, worst-case incident energy and the corresponding working distance, date of the analysis, and equipment name.

2. Switchgear, motor control centers, and other multi-section equipment shall be provided with a duplicate label for each vertical section.

3. Equipment with arc reduction maintenance mode switches shall include a dual label with the worst-case calculated incident energy level with and without the switch enabled. The label shall clearly identify the associated maintenance mode switch that shall be enabled in order for the lower incident energy level to apply.

3.3 PROTECTIVE DEVICE STUDY

A. Contractor shall commission a short circuit study and protective device study of relays, fuses, circuit breakers, and all other protective devices and shall submit a coordination and protective device settings report as specified herein. The study shall be in compliance with IEEE 242 and include the entire distribution system, including any and all existing power distribution components which will impact the results of the protective device study, starting with the smallest – 480 volt, 3 phase, 60 Hz – circuit protective device on the load end, to the nearest protective device on the power company's line side. Where existing electrical distribution system components are part of the study, the Contractor shall field verify and report the respective ratings and settings of each device as found as a prerequisite to the study analysis being performed. Protective device settings shall be selected to provide selective coordination to the maximum extent possible for equipment protection and device coordination while balancing the goal to reduce the calculated incident energy to the greatest extent possible.

B. Contractor shall be responsible for and shall ensure that all relays, protective devices and circuit breakers shown on the Drawings and Specifications are sized and set according to the study results.

C. The study shall include, but shall not be limited to, the following:

1. Color-coded printouts of coordination curves prepared with calculation software.

2. A tabulation of all protective relay and circuit breaker trip settings and recommended sizes and types of medium-voltage fuses.

3. Motor starting profiles for all 50 horsepower and larger motors.

4. Transformer damage curves and protection, evaluated in accordance with IEEE C57.109.

5. Generator damage curves and protection, evaluated in accordance with manufacturers recommendations.

6. Coordination curve(s) from the power company, if available.

7. Calculated short-circuit values at all nodes in the distribution system included within the scope of the protective device study.

8. Protective device settings shall include, but not limited to, motor and pump RTD settings, motor starts per hour, bus and transformer differential settings, synch-check settings, under and over-voltage settings, under and over-frequency settings, low-voltage breaker and MCC starter overload settings, and all protective functions shown on the Drawings and Specifications

9. Adjustable frequency drive settings evaluated in accordance with the manufacturer's recommendations and driven equipment requirements

10. Reduced voltage starter settings evaluated in accordance with the manufacturer's recommendations and driven equipment requirements

D. An Engineering and Testing Services firm acceptable to Engineer shall conduct the protective device study.

E. Contractor shall be responsible for obtaining the following:

1. The coordination curves for relays, fuses, and circuit breakers.

2. Transformer damage curves.

3. Motor and pump data.

4. Generator data

5. Other applicable information for all new and existing electrical equipment.

F. Contractor shall coordinate with the power company to obtain the required protective device curves and shall be responsible for all the field work associated with obtaining the necessary data on existing relays, circuit breakers, fuses, and transformers to be included in the protective device study.

G. The available 3 phase, symmetrical fault current at the point of service shall be obtained from the Power Company.

H. The protective device report shall be bound in a standard 8-1/2 by 11 inch three-ring binder and shall be submitted in accordance with the Submittal Procedures section. Final selection of all protective device settings or sizes shall be subject to review and acceptance by Engineer.

3.4 CABLE INSTALLATION

A. General

1. Except as otherwise specified or indicated on the Drawings, cable shall be installed according to the following procedures, taking care to protect the cable and to avoid kinking the conductors, cutting or puncturing the jacket, contamination by oil or grease, or any other damage. Circuits to supply electric power and control to equipment and devices, communication and signal circuits as indicated on the one-line diagrams shall be installed continuous and may not be spliced unless approved by the Engineer.

2. Stranded conductor cable shall be terminated by lugs or pressure type connectors. Wrapping stranded cables around screw type terminals is not acceptable.

3. Stranded conductor cable shall be spliced by crimp type connectors. Twist-on wire connectors may only be used for splicing solid cable and for terminations at lighting fixtures.

4. Splices may be made only at readily accessible locations.

5. Cable terminations and splices shall be made as recommended by the cable manufacturer for the particular cable and service conditions.

6. All 5,000 volt rated cable and above shielded cable stress cone terminations shall be IEEE Class 1 molded rubber type. Shielded cable splices shall be tape or molded rubber type as required. Shielded cable splices and stress cone terminations shall be made by qualified splicers. Materials shall be by 3M Company, Plymouth/Bishop, or Raychem Electric Power Products.

7. Cable shall not be pulled tight against bushings nor pressed heavily against enclosures.

8. Cable-pulling lubricant shall be compatible with all cable jackets; shall not contain wax, grease, or silicone; and shall be Polywater "Type J".

9. Cables operating at more than 2000 volts shall be fireproofed in all cable vaults, manholes, and handholes. Fireproofing shall be applied with a half-lapped layer of 3M "Scotch 77

Arc-Proofing Tape", anchored at each end with a double wrap of 3M "Scotch 69 Glass Cloth Tape" or with equivalent tape by Anixter or Plymouth/Bishop.

10. Where necessary to prevent heavy loading on cable connections, in vertical risers, the cable shall be supported by Kellems, or equal, woven grips.

11. Spare cable ends shall be taped, coiled, and identified.

12. Cables shall not be bent to a radius less than the minimum recommended by the manufacturer. For cables rated higher than 600 volts, the minimum radius shall be 8 diameters for nonshielded cable and 12 diameters for shielded cable.

13. All cables in one conduit, over 1 foot long, or with any bends, shall be pulled in or out simultaneously.

14. Circuits to supply electric power and control to equipment and devices are indicated on the one-line diagrams. Conductors in designated numbers and sizes shall be installed in conduit of designated size. Circuits shall not be combined to reduce conduit requirements unless acceptable to Engineer.

15. Instrument cable shields and drain wires shall be continuous over the entire length of the circuit and grounded at one end only. In general, the field end of the shield shall be ungrounded. At the ungrounded termination of the circuit, the shield and drain wire shall be insulated by taping to prevent grounding.

16. Cables operating at more than 2,000 volts which terminate at medium-voltage padmounted equipment bushings shall include a metal oxide varistor surge protective elbow terminator conforming to IEEE Standard 386. Elbows shall provide a weatherproof, dead-front, hot-stick operable separable connection. Surge protector rating shall be as recommended by the terminator supplier.

B. Underground Cable Pulling Procedure

1. Care shall be taken to prevent excessive physical stresses that would cause mechanical damage to cables during pulling. Before pulling cables into the underground duct system the Contractor shall submit a pulling procedure.

2. The procedure shall include the following information:

   a. Point of cable entrance into the duct system.
   b. Point of cable exit from the duct system.
   c. Type of cable grip to be used.
   d. Type of pulling device to be used.
   e. Method of continuously monitoring cable tension during pulling.
   f. Identification of manholes through which cable will be pulled or where splices will be made.
   g. Size and type of cable sheave assemblies to be used.

C. Medium-Voltage Cable Insulation Test

1. New conductors with insulation rated 5,000 volts and higher shall be given a field dc insulation test.

2. The ampacity rating of direct current testing equipment shall be at least 2,500 microamperes.

3. Final test voltages and the duration of the test shall be as indicated on the Cable Data Sheets attached to this section. Cable insulation testing shall be recorded on the Cable Test Data Form attached to this section, Figure 16-16050.

4. Test procedures shall conform to ICEA S-93-639 (NEMA WC 74), 5-46 kV Shielded Power Cable For Use In The Transmission & Distribution of Electric Energy, and the applicable qualification testing standards of AEIC CS-8.

5. The tests shall be performed by qualified and experienced personnel specializing in electrical cable testing. Triplicate copies of test data for each cable shall be submitted to Engineer.

6. Existing shielded conductors with insulation rated 5,000 volts and higher shall be given a very low frequency ac tangent delta test.

7. Each phase of the circuit shall be tested for the entire cable system including all terminations, cable, and joints within the circuit. Where existing conductors are spliced to a new conductor, the existing conductor shall be tested before splicing and after splicing.

8. Duration of the test at each voltage shall be a minimum of 3 minutes. Tangent delta testing shall be recorded and submitted to the Engineer for review. The results shall include at a minimum the VLF-TD time stability measured by standard deviation at U_0, differential VLF-TD between 0.5 U_0 and 1.5 U_0, and mean VLF-TD at U_0.

9. Test procedures shall conform to IEEE 400.2, Guide for Field Testing of Shielded Power Cable Systems Using Very low Frequency (VLF) (less than 1 Hz).

10. The tests shall be performed by qualified and experienced personnel specializing in electrical cable testing. Triplicate copies of test data for each cable shall be submitted to Engineer.

3.5 RACEWAY INSTALLATION

A. Contractor shall be responsible for routing all raceway. This shall include all conduits indicated on the one-lines, riser diagrams, circuit schedules, and home-runs shown on the plan Drawings. Conduits shall be routed as defined in these Specifications. Where conduit routing is shown on plans, it shall be considered a general guideline and shall be field verified to avoid interferences.

B. Except as otherwise specified or indicated on the Drawings, conduit installation and identification shall be completed according to the following procedures.

C. Installation of Interior and Exposed Exterior Conduit

1. This section covers the installation of conduit inside structures, above and below grade, and in exposed outdoor locations. In general, conduit inside structures shall be concealed. Large conduit and conduit stubs may be exposed unless otherwise specified or indicated on the Drawings. No conduit shall be exposed in water chambers unless so indicated on the Drawings.

2. Unless otherwise indicated on the Drawings, Contractor shall be responsible for routing the conduit to meet the following installation requirements:

    a. Conduit installed in dry indoor locations shall be reinforced thermosetting resin conduit. Exposed conduit shall be rigidly supported by aluminum, stainless-steel, or fiberglass framing materials. Mounting hardware, which includes nuts, bolts, and anchors, shall be stainless steel.

    b. Conduit that is direct buried or installed in concrete floor slabs, walls, and underground ductbank shall be rigid Schedule 40 PVC.

    c. Conduit installed outdoors or in wet or damp locations, such as a wet well or pipe gallery, shall be reinforced thermosetting resin, rigidly supported by aluminum, stainless-steel, or fiberglass framing materials. Mounting hardware, which includes nuts, bolts, and anchors, shall be stainless steel.

    d. Final connections to dry type transformers, to motors without flexible cords, and to other equipment with rotating or moving parts shall be liquidtight flexible metal conduit with watertight connectors installed without sharp bends and in the minimum lengths required for the application, but not longer than 6 feet unless otherwise acceptable to Engineer.

    e. Terminations and connections of rigid aluminum conduit shall be taper threaded. Conduits shall be reamed free of burrs and shall be terminated with conduit bushings.

    f. Exposed conduit shall be installed either parallel or perpendicular to structural members and surfaces.

    g. Two or more conduits in the same general routing shall be parallel, with symmetrical bends.

    h. Conduits shall be at least 6 inches from high temperature piping, ducts, and flues.

    i. Rigid Schedule 40 and 80 PVC conduit shall have supports and provisions for expansion as required by NEC Article 352.

    j. Metallic conduit connections to sheet metal enclosures shall be securely fastened by locknuts inside and outside.

k. Rigid Schedule 40 and 80 PVC conduit shall be secured to sheet metal device boxes using a male terminal adapter with a locknut inside or by using a box adapter inserted through the knockout and cemented into a coupling.

l. Conduits in walls or slabs, which have reinforcement in both faces, shall be installed between the reinforcing steel. In slabs with only a single layer of reinforcing steel, conduits shall be placed under the reinforcement. Conduits larger than 1/3 of the slab thickness shall be concrete encased under the slab.

m. Where indicated and at conduits that cross structural joints where structural movement is allowed shall be fitted with concretetight and watertight expansion/deflection couplings, suitable for use with specified conduit. The couplings shall be Appleton Type DF, Crouse-Hinds Type XD, or O-Z Type DX.

n. Conduit shall be clear of structural openings and indicated future openings.

o. Conduits through roofs or metal walls shall be flashed and sealed watertight.

p. Conduit installed through any openings cut into non-fire rated concrete or masonry structure elements shall be neatly grouted. Conduit penetrations of fire rated structure elements shall be sealed in a manner that maintains the fire rating as indicated on the Architectural Drawings.

q. Conduits shall be capped during construction to prevent entrance of dirt, trash, and water.

r. Exposed conduit stubs for future use shall be terminated with galvanized pipe caps.

s. Concealed conduit for future use shall be terminated in equipment or fitted with couplings plugged flush with structural surfaces.

t. Where the Drawings indicate future duplication of equipment wired hereunder, concealed portions of conduits for future equipment shall be provided.

u. Horizontal conduit shall be installed to allow at least 7 feet of headroom, except along structures, piping, and equipment or in other areas where headroom cannot be maintained.

v. Conduit shall not be routed across the surface of a floor, roof, or walkway unless approved by Engineer.

w. All conduits that enter enclosures shall be terminated with acceptable fittings that will not affect the NEMA rating of the enclosure.

x. Conduit which turns out of concrete slabs or walls, shall be connected to a 90 degree elbow of PVC-coated rigid steel conduit before it emerges. Conduits shall have PVC-coated rigid steel coupling embedded a minimum of 3 inches

when emerging from slabs or walls and the coupling shall extend 2 inches from the wall.

D. Underground Conduit Installation

1. All excavation, backfilling, and concrete work shall conform to the respective sections of these Specifications. Underground conduit shall conform to the following requirements:

   a. All underground conduits shall be concrete encased unless indicated otherwise on the Drawings. Concrete encasement within 15 feet of building entrances, under and within 5 feet of roadways, and within 10 feet of indicated future excavations shall be reinforced as detailed on the Drawings.
   b. Concrete encased conduit shall be schedule 40 PVC. Conduits shall have PVC-coated rigid steel coupling embedded a minimum of 3 inches when emerging from walls and the coupling shall extend 2 inches from the wall. All PVC joints shall be solvent welded in accordance with the recommendations of the manufacturer.
   c. Concrete encasement on exposed outdoor conduit risers shall continue to 6 inches above grade, with top crowned and edges chamfered.
   d. Conduit and concrete encasement installed underground for future extension shall be terminated flush at the bulkhead with a coupling and a screw plug. The termination of the duct bank shall be reinforced with bars 100 diameters long that shall be terminated 2 inches from the bulkhead. Matching splice bars shall be 50 bar diameters long. Each longitudinal bar shall be provided with a Lenton "Form Saver" coupler and plate or a Dayton "Superior DBR" coupler at the bulkhead. The coupler shall be threaded to accept a dowel of like diameter in the future. Threads shall be protected with screw-in plastic caps. A 1-3/4 by 3/4 inch deep horizontal shear key shall be formed in the concrete encasement above and below the embedded conduits. After concrete placement, conduit and bar connector ends shall be cleaned and coated with two coats of thixotropic coal tar.
   e. Underground conduits indicated not to be concrete encased shall be rigid Schedule 40 PVC.
   f. Underground conduit bend radius shall be at least 2 feet at vertical risers and at least 3 feet elsewhere.
   g. Underground conduits and conduit banks shall have at least 2 feet of earth cover, except where indicated otherwise.
   h. Underground conduit banks through building walls shall be cast in place, or concreted into boxouts, with water stops on all sides of the boxout. Water stops are specified in the Cast-In-Place Concrete section.
   i. Underground nonmetallic conduits, which turn out of concrete or earth in outdoor locations, shall be connected to 90 degree elbows of PVC-coated rigid steel conduit before they emerge.
   j. Conduits not encased in concrete and passing through walls, which have one side in contact with earth, shall be sealed watertight with special rubber-gasketed sleeve and joint assemblies or with sleeves and modular rubber sealing elements.
   k. Underground conduits shall be sloped to drain from buildings to manholes.
   l. Each 5 kV or higher voltage cable, each 250 kcmil or larger cable, and each conduit group of smaller cables shall be supported from manhole walls by Kindorf "D-990"

or Unistrut "P-3259" inserts, with Kindorf "F-721-24" or Unistrut "P-2544" brackets and Unistrut "P1753" or "P1754" fiberglass reinforced polyester cable saddles.

m. Telephone cables shall not be installed in raceways, conduits, boxes, manholes, or handholes containing other types of circuits.

n. Intercommunication and instrument cables shall be separated the maximum possible distance from all power wiring in pull-boxes, manholes, and handholes.

E. Sealing of Conduits

1. After cable has been installed and connected, conduit ends shall be sealed by forcing nonhardening sealing compound into the conduits to a depth at least equal to the conduit diameter. This method shall be used for sealing all conduits at handholes, manholes, and building entrance junction boxes, and for 1 inch and larger conduit connections to equipment.

2. Conduits entering chlorine feed and storage rooms shall be sealed in a junction box or conduit body adjacent to the point of entrance.

3. Conduits entering hazardous (classified) areas and submersible or explosion proof enclosures shall have Appleton "Type ESU" or Crouse-Hinds "EYS" sealing fittings with sealing compound.

F. Reuse of Existing Conduits

1. Existing conduits shall not be reused.

G. Cable Tray Installation

1. Cable tray shall be installed per NEMA VE 2, NEC and manufacturers installation instructions and as indicated on the drawings. Exact cable tray mounting height and location shall be coordinated by the Contractor with other equipment and structures to avoid interferences.

3.6 WIRING DEVICES, BOXES, AND FITTINGS INSTALLATION

A. Metallic and nonmetallic conduit boxes and fittings shall be installed in the following locations:

B. Conduit Boxes and Fittings

1. Stainless-steel boxes shall be installed in the indoor faces of masonry walls, in interior partition walls, and in joist supported ceilings.

2. Rigid PVC device boxes shall be installed in exposed nonmetallic conduit systems.

3. PVC coated boxes and fittings shall be installed in PVC coated conduit systems.

4. Telephone conduit shall be provided with separate junction boxes and pull fittings.

3.7 SUBMERSIBLE BOXES INSTALLATION

A. Install submersible boxes and cable glands according to manufacturer's installation instruction as required to achieve specified submersion depth.

3.8 EQUIPMENT INSTALLATION

A. Except as otherwise specified or indicated on the Drawings, the following procedures shall be used in performing electrical work.

B. Setting of Equipment

1. All equipment, boxes, and gutters shall be installed level and plumb. Boxes, equipment enclosures, metal raceways, and similar items mounted on water- or earth-bearing walls shall be separated from the wall by at least 1/4 inch thick corrosion-resistant spacers. Where boxes, enclosures, and raceways are installed at locations where walls are not suitable or available for mounting, concrete equipment pads, framing material, and associated hardware shall be provided.

C. Sealing of Equipment

1. All outdoor substation, switchgear, motor control center, and similar equipment shall be permanently sealed at the base, and all openings into equipment shall be screened or sealed with concrete grout to keep out rodents and insects the size of wasps and mud daubers. Small cracks and openings shall be sealed from inside with silicone sealant, Dow-Corning "795" or General Electric "SCS1200".

3.9 GROUNDING

A. General

1. The electrical system and equipment shall be grounded in compliance with the National Electrical Code and the following requirements:
    a. All ground conductors shall be at least 12 AWG soft drawn copper cable or bar, bare or green-insulated in accordance with the National Electrical Code.
    b. Ground cable splices and joints, ground rod connections, and equipment bonding connections shall meet the requirements of IEEE 837, and shall be exothermic weld connections or irreversible high-compression connections, Cadweld "Exothermic" or Burndy "Hyground". Mechanical connectors will not be acceptable. Cable connections to bus bars shall be made with high-compression two-hole lugs.

c. Ground cable through exterior building walls shall enter within 3 feet below finished grade and shall be provided with a water stop. Unless otherwise indicated, installation of the water stop shall include filling the space between the strands with solder and soldering a 12 inch copper disc over the cable. The copper disc shall be installed on the exterior of the wall and shall be a minimum thickness of 12 gauge and have a diameter that is a minimum of 2 inch larger than the diameter of the core hole that the ground cable passes through. The copper disc shall be soldered to the ground cable and caulk shall be applied around the outside edge of the copper disc where it adjoins the exterior wall. Caulk rated for submerged application shall comply with the Joint Sealants section.

d. Ground cable near the base of a structure shall be installed in earth and as far from the structure as the excavation permits, but not closer than 24 inches. The tops of ground rods and ground cable interconnecting ground rods shall be buried a minimum of 30 inches below grade, or below the frost line, whichever is deeper.

e. All powered equipment, including lighting fixtures and receptacles, shall be grounded by a copper ground conductor in addition to the conduit connection.

f. Ground connections to equipment and ground buses shall be made with copper or high conductivity copper alloy ground lugs or clamps. Connections to enclosures not provided with ground buses or ground terminals shall be made with irreversible high-compression type lugs inserted under permanent assembly bolts or under new bolts drilled and inserted through enclosures, other than explosion proof enclosures, or by grounding locknuts or bushings. Ground cable connections to anchor bolts; against gaskets, paint, or varnish; or on bolts holding removable access covers will not be acceptable.

g. The grounding system shall be bonded to the station piping by connecting to the first flange inside the building, on either a suction or discharge pipe, with a copper bar or strap. The flange shall be drilled and tapped to provide a bolted connection.

h. Ground conductors shall be routed as directly as possible, avoiding unnecessary bends. Ground conductor installations for equipment ground connections to the grounding system shall have turns with minimum bend radii of 12 inches.

i. Ground rods not described elsewhere shall be a minimum of 3/4 inch in diameter by 10 feet long, with a copper jacket bonded to a steel core.

j. Test wells and covers for non-traffic areas shall be molded high density polyethylene. Test wells for traffic areas shall be precast concrete construction rated for traffic duty with concrete or cast iron covers.

B. Grounding System Resistance

1. The ground system resistance shall comply with National Electrical Code.

2. The grounding system design depicted on the Contract Drawings is the minimum design required for each building or structure. Each system shall comply with the maximum

resistance of 5 ohms to ground. Contractor shall confirm the system grounding resistance with the results of the testing specified herein. Systems exceeding the maximum resistance specified shall be supplemented with additional grounding provisions and retested until the maximum specified resistance is achieved.

C. Grounding System Testing

1. The grounding system of each new building or structure and each existing building or structure indicated below, shall be tested to determine the resistance to earth. Testing shall be performed by an independent electrical or grounding system testing organization. Testing shall be completed after not less than three full days without precipitation and without any other moistening or chemical treatment of the soil.

2. New Grounding Systems

a. Grounding systems of each new building or structure shall be tested for resistance to earth utilizing the three-point fall of potential test as defined by IEEE 81. Testing shall be completed prior to installation of the electrical distribution equipment to ensure the grounding system is isolated from the utility grounding system and the systems of other structures. The current source probe for the test shall be placed in soil at a distance of 5 to 10 times the distance of the widest measurement across the grounding system ring or grid to ensure adequate measurements outside of the grounding system's sphere of influence. Test probe measurements shall be taken at a distance of one foot from the grounding system reference connection and at each 10 percent increment from the grounding system reference connection to the current source probe location. Test results shall be documented on a graphical plot with resistance in ohms on the vertical axis and distance in feet on the horizontal axis. The results shall clearly indicate a system resistance plateau which confirms a valid test procedure.

3. Existing Grounding Systems

a. Grounding systems of each existing building or structure indicated shall be tested for resistance to earth.
b. Where existing grounding systems can be isolated from the building power service or utility power service a three-point fall of potential test shall be completed as indicated above. Where isolation of the building grounding system is not practical, a clamp-on resistance test will be an acceptable alternative. Clamp-on resistance testing shall be completed utilizing a ground resistance tester specifically designed for clamp on resistance testing, such as the AEMC "Model 3711". Clamp-on resistance measurements shall be taken at the service side of the service entrance neutral, upstream of the neutral to ground bonding connection to ensure a single path between the grounding system and the utility reference.

4. Grounding System Test Report

a. A report certified by the testing organization shall be prepared and submitted in accordance with the Submittal Procedures section. The final report shall include complete testing results for each building or structure, graphical representation of

the test point results for the three-point fall of potential method, and complete observations of all site weather conditions and other environmental conditions that may affect the test results. Final acceptance of the results reported shall be subject to the review and approval of Engineer.

3.10 MODIFICATIONS TO EXISTING EQUIPMENT

A. Modifications to existing equipment shall be completed as specified herein and indicated on the Drawings. All existing facilities shall be kept in service during construction. Temporary power or relocation of existing power and control wiring, equipment, and devices shall be provided as required during construction. Coordination and timing of outages shall be as specified in other sections of these Specifications. Electrical power interruptions will only be allowed where agreed upon in advance with Owner, and scheduling at times of low demand may be required.

B. Demolition

1. Unless otherwise specified or indicated on the Drawings, all cable and all exposed conduit for power and control signals of equipment indicated to be removed shall be demolished. Conduit supports and electrical equipment mounting hardware shall be removed, and holes or damage remaining shall be grouted or sealed flush. Conduit partially concealed shall be removed where exposed, and plugged with expanding grout flush with the floor or wall. Repairs shall be refinished to match the existing surrounding surfaces. Demolished equipment shall be discarded or salvaged as indicated on the Drawings and as specified in other sections of these Specifications.

End of Section

STANDARD SPECIFICATIONS

REFERENCE:	UL 83, ICEA S-95-658 (NEMA WC70).
CONDUCTOR:	Solid, uncoated copper. Maximum operating temperature 90°C dry, 75°C wet.
INSULATION:	Polyvinyl chloride, UL 83, Type THHN and THWN, ICEA S-95-658.
SHIELD:	None.
JACKET:	Conductor: Nylon, 4 mils (100 µm) minimum thickness, UL 83.
FACTORY TESTS:	Cable shall meet the requirements of UL 83 for Type THHN and THWN.

Cable Details

Size		Number of Strands	Conductor Insulation Thickness*		Maximum Outside Diameter	
AWG or kcmil	mm^2		in.	µm	in.	mm
12	4.0	1	0.015	380	0.17	4.32
10	6.0	1	0.020	510	0.20	5.08

*The average thickness shall be not less than that indicated above. The minimum thickness shall not be less than 90 percent of the values indicated above.

A durable marking shall be provided on the surface of the cable at intervals not exceeding 24 inches (600 mm). Marking shall include manufacturer's name, THWN or THHN, conductor size, and 600 volt.

600 Volt, Single Conductor Lighting Cable (600-1-PVC-THHN-THWN)

BLACK & VEATCH	**Cable Data**	**Figure 1-16050**

STANDARD SPECIFICATIONS

REFERENCE: ICEA S-95-658 (NEMA WC 70).

CONDUCTOR: Concentric-lay, uncoated copper; strand Class B. Wet/dry maximum operating temperature 90°C.

INSULATION: Cross-linked thermosetting polyethylene, ICEA S-95-658, Paragraph 3.6.

SHIELD: None.

JACKET: None.

FACTORY TESTS: Cable shall meet the requirements of ICEA S-95-658.

Cable Details

Size		Number of Strands	Conductor Insulation Thickness*		Maximum Outside Diameter	
AWG or kcmil	mm^2		in.	μm	in.	mm
14	2.5	7	0.030	760	0.17	4.32
12	4.0	7	0.030	760	0.19	4.83
10	6.0	7	0.030	760	0.21	5.33
8	10.0	7	0.045	1140	0.27	6.86
6	16.0	7	0.045	1140	0.31	7.87
4	25.0	7	0.045	1140	0.36	9.14
2	35.0	7	0.045	1140	0.42	10.67
1	40.0	19	0.055	1400	0.48	12.19
1/0	50.0	19	0.055	1400	0.52	13.21
2/0	70.0	19	0.055	1400	0.57	14.48
4/0	95.0	19	0.055	1400	0.68	17.27
250	120.0	37	0.065	1650	0.75	19.05
350	185.0	37	0.065	1650	0.85	21.59
500	300.0	37	0.065	1650	0.98	24.89
750	400.0	61	0.080	2030	1.22	31.00
1,000	500.0	61	0.080	2030	1.37	34.80

*The average thickness shall be not less than that indicated above. The minimum thickness shall be not less than 90 percent of the values indicated above.

A durable marking shall be provided on the surface of the cable at intervals not exceeding 24 inches (600 mm). Marking shall include manufacturer's name, XLP, XHHW-2, conductor size, and voltage class.

600 Volt, Single Conductor Lighting/Power Cable (600-1-XLP-NONE-XHHW-2)

BLACK & VEATCH	Cable Data	Figure 2-16050

STANDARD SPECIFICATIONS

REFERENCE: UL 83, ICEA S-95-658 (NEMA WC 70).

CONDUCTOR: Stranded, uncoated copper. Maximum operating temperature 90°C dry, 75°C wet.

INSULATION: Polyvinyl chloride, UL 83, Type THHN and THWN, ICEA S-95-658.

SHIELD: None.

JACKET: Conductor: Nylon, 4 mils (100 μm) minimum thickness, UL 83.

FACTORY TESTS: Cable shall meet the requirements of UL 83 for Type THHN and THWN.

Cable Details

Size		Number of Strands	Conductor Insulation Thickness*		Maximum Outside Diameter	
AWG or kcmil	mm^2		in.	μm	in.	mm
14	2.5	19	0.015	381	0.12	3.05
12	4.0	19	0.015	381	0.14	3.56
10	6.0	19	0.020	508	0.17	4.32
8	10.0	19	0.030	762	0.23	5.84
6	16.0	19	0.030	762	0.26	6.60
4	25.0	19	0.040	1016	0.33	8.38
2	35.0	19	0.040	1016	0.39	9.91
1	40.0	19	0.050	1270	0.44	11.18
1/0	50.0	19	0.050	1270	0.50	12.70
2/0	70.0	19	0.050	1270	0.54	13.72
4/0	95.0	19	0.050	1270	0.66	16.76
250	120.0	37	0.060	1520	0.72	18.29
350	185.0	37	0.060	1520	0.83	21.08
500	300.0	37	0.060	1520	0.96	24.38
750	400.0	61	0.070	1780	1.17	29.72
1,000	500.0	61	0.070	1780	1.32	33.53

*The average thickness shall be not less than that indicated above. The minimum thickness shall be not less than 90 percent of the values indicated above.

A durable marking shall be provided on the surface of the cable at intervals not exceeding 24 inches (600 mm). Marking shall include manufacturer's name, THWN or THHN, conductor size, and 600 volt.

600 Volt, Single Conductor Power Cable (600-1-PVC-THHN-THWN)

BLACK & VEATCH	Cable Data	Figure 3-16050

STANDARD SPECIFICATIONS

REFERENCE:	UL 66, UL 1277.
CONDUCTOR:	16 AWG (1.5 mm^2), 7-strand, concentric-lay, uncoated copper. Maximum operating temperature 90°C dry, 75°C wet.
INSULATION:	Polyvinyl chloride, not less than 15 mils (380 μm) average thickness; 13 mils (330 μm) minimum thickness, UL 66, Type TFN.
LAY:	Twisted pair with 1-1/2 inch to 3 inch (38.10 mm - 63.5 mm) lay.
SHIELD:	Cable assembly, combination aluminum-polyester tape and 7-strand, 20 AWG (0.5 mm^2) minimum size, tinned copper drain wire, shield applied to achieve 100 percent cover over insulated conductors.
JACKET:	Conductor: Nylon, 4 mils (100 μm) minimum thickness, UL 66. Cable assembly: Black, flame-retardant polyvinyl chloride, UL 1277, applied over tape-wrapped cable core.
CONDUCTOR IDENTIFICATION:	One conductor black, one conductor white.
FACTORY TESTS:	Insulated conductors shall meet the requirements of UL 66 for Type TFN. Assembly jacket shall meet the requirements of UL 1277. Cable shall meet the vertical-tray flame test requirements of UL 1277.

Cable Details

	Assembly Jacket Thickness*		**Maximum Outside Diameter**	
	in.	**μm**	**in.**	**mm**
Single Pair	0.045	1140	0.34	8.64

*The average thickness shall be not less than that indicated above. The minimum thickness shall be not less than 80 percent of the value indicated above.

A durable marking shall be provided on the surface of the cable at intervals not exceeding 24 inches (600 mm). Marking shall include manufacturer's name, Type TC-ER, Type TFN, conductor size, single pair, and voltage class.

600 Volt, Single Pair, Shielded Instrument Cable (600-SINGLE-PAIR-SH-INSTR)

BLACK & VEATCH	**Cable Data**	**Figure 4-16050**

STANDARD SPECIFICATIONS

REFERENCE:	UL 66, UL 1277.
CONDUCTOR:	16 AWG (1.5 mm^2), 7-strand, concentric-lay, uncoated copper. Maximum operating temperature 90°C dry, 75°C wet.
INSULATION:	Polyvinyl chloride, not less than 15 mils (380 µm) average thickness; 13 mils (330 µm) minimum thickness, UL 66, Type TFN.
LAY:	Twisted triad with 1-1/2 inch to 3 inch (38.10 mm - 63.5 mm) lay.
SHIELD:	Cable assembly, combination aluminum-polyester tape and 7-strand, 20 AWG (0.5 mm^2) minimum size, tinned copper drain wire, shield applied to achieve 100 percent cover over insulated conductors.
JACKET:	Conductor: Nylon, 4 mils (100 µm) minimum thickness, UL 66. Cable assembly: Black, flame-retardant polyvinyl chloride, UL 1277, applied over tape-wrapped cable core.
CONDUCTOR IDENTIFICATION:	One conductor black, one conductor white, one conductor red.
FACTORY TESTS:	Insulated conductors shall meet the requirements of UL 66 for Type TFN. Assembly jacket shall meet the requirements of UL 1277. Cable shall meet the vertical-tray flame test requirements of UL 1277.

Cable Details

	Assembly Jacket Thickness*		Maximum Outside Diameter	
	in.	**µm**	**in.**	**mm**
Single Triad	0.045	1140	0.35	8.87

*The average thickness shall be not less than that indicated above. The minimum thickness shall be not less than 80 percent of the value indicated above.

A durable marking shall be provided on the surface of the cable at intervals not exceeding 24 inches (600 mm). Marking shall include manufacturer's name, Type TC-ER, Type TFN, conductor size, single triad, and voltage class.

600 Volt, Single Triad, Shielded Instrument Cable (600-SINGLE-TRIAD-SH-INSTR)

BLACK & VEATCH	**Cable Data**	**Figure 5-16050**

STANDARD SPECIFICATIONS

REFERENCE: UL 66, UL 1277.
CONDUCTOR: 18 AWG (0.75 mm^2), 7-strand, concentric-lay, uncoated copper. Maximum operating temperature 90°C dry, 75°C wet.
INSULATION: Polyvinyl chloride, not less than 15 mils (380 μm) average thickness; 13 mils (330 μm) minimum thickness, UL 66, Type TFN.
LAY: Twisted pairs or triads with 1-1/2 inch to 3 inch (38.10 - 63.5 mm) lay.
SHIELD: Each pair or triad and cable assembly: Combination aluminum-polyester tape and 7-strand, 20 AWG (0.5 mm^2) minimum size, tinned copper drain wire, shield applied to achieve 100 percent cover over insulated conductors. Shield tape on pair and/or triad assemblies shall be applied in such a way as to give total shield isolation from all other pairs' or triads' shields.
JACKET: Conductor: Nylon, 4 mils (100 μm) minimum thickness, UL 66.
Cable Assembly: Black, 90°C, flame-retardant polyvinyl chloride, UL 1277, Table 10.17, applied over tape-wrapped cable core.
CONDUCTOR IDENTIFICATION:
Pair: One conductor black, one conductor white.
Triad: One conductor black, one conductor white, one conductor red.
PAIR Identification: Each pair and/or triad numbered.
FACTORY TESTS: Insulated conductors shall meet the requirements of UL 66 for Type TFN. Assembly jacket shall meet the requirements of UL 1277. Cable shall meet the vertical-tray flame test requirements of UL 1277.

Cable Details

	Assembly Jacket Thickness*		**Maximum Outside Diameter**	
	in.	**μm**	**in.**	**mm**
Number of Pairs				
4	0.045	1140	0.554	14.07
8	0.060	1520	0.749	19.02
12	0.060	1520	0.896	22.76
24	0.060	1520	1.256	31.90
Number of Triads				
4	0.060	1520	0.648	16.46
8	0.060	1520	0.823	20.99
12	0.080	2030	1.030	26.16
24	0.080	2030	1.393	35.38

*The average thickness shall be not less than that indicated above. The minimum thickness shall be not less than 80 percent of the values indicated above.
A durable marking shall be provided on the surface of the cable at intervals not exceeding 24 inches (600 mm). Marking shall include manufacturer's name, Type TC-ER, Type TFN, conductor size, number of pairs or triads, and voltage class.

600 Volt, Multiple Pair and/or Triad, Shielded Instrument Cable
(600-MULTI-PAIRS-TRIADS-SH-INSTR)

BLACK & VEATCH	**Cable Data**	**Figure 6-16050**

STANDARD SPECIFICATIONS

REFERENCE: UL 83, UL 1277, ICEA S-73-532, ICEA S-58-679.

CONDUCTOR: 14 AWG (2.5 mm^2), 7 or 19 strands, concentric-lay, uncoated copper. Maximum operating temperature 90°C dry, 75°C wet.

INSULATION: Polyvinyl chloride, not less than 15 mils (380 μm) average thickness; 13 mils (330 μm) minimum thickness, UL 83, Type THHN and THWN.

SHIELD: None.

JACKET: Conductor: Nylon, 4 mils (100 μm) minimum thickness, UL 83.

Cable assembly: Black, flame-retardant polyvinyl chloride, UL 1277, applied over tape-wrapped cable core.

CONDUCTOR IDENTIFICATION: ICEA S-58-679, Method 1, Table 2 or ICEA S-58-679, Method 3, Table 2. White or green conductors shall not be provided.

FACTORY TESTS: Insulated conductors shall meet the requirements of UL 83 for Type THHN-THWN. Assembly jacket shall meet the requirements of UL 1277. Cable shall meet the flame test requirements of UL 1277 for Type TC-ER power and control tray cable.

Cable Details

Number of Conductors	Assembly Jacket Thickness*		Maximum Outside Diameter	
	in.	μm	in.	mm
2	0.045	1140	0.38	9.65
3	0.045	1140	0.39	9.91
4	0.045	1140	0.44	11.18
5	0.045	1140	0.46	11.68
7	0.045	1140	0.49	12.45
9	0.045	1140	0.61	15.49
12	0.060	1520	0.66	16.76
19	0.060	1520	0.77	19.56
24	0.060	1520	0.93	23.62
30	0.080	2030	0.98	24.89
37	0.080	2030	1.05	26.67

*The average thickness shall be not less than that indicated above. The minimum thickness shall be not less than 80 percent of the values indicated above.

A durable marking shall be provided on the surface of the cable at intervals not exceeding 24 inches (600 mm). Marking shall include manufacturer's name, Type TC-ER, Type THWN or THHN, conductor size, number of conductors, and voltage class.

600 Volt, Multiconductor 14 AWG (2.5 mm^2) Control Cable (600-MULTI-THHN-THWN)

BLACK & VEATCH	Cable Data	Figure 7-16050

STANDARD SPECIFICATIONS

REFERENCE:	UL 83, UL 1277, ICEA S-73-532, ICEA S-58-679.
CONDUCTOR:	12 AWG (4 mm^2), 7 or 19 strands, concentric-lay, uncoated copper. Maximum operating temperature 90°C dry, 75°C wet.
INSULATION:	Polyvinyl chloride, not less than 15 mils (380 μm) average thickness; 13 mils (330 μm) minimum thickness, UL 83, Type THHN and THWN.
SHIELD:	None.
JACKET:	Conductor: Nylon, 4 mils (100 μm) minimum thickness, UL 83. Cable assembly: Black, flame-retardant polyvinyl chloride, UL 1277, applied over tape-wrapped cable core.
CONDUCTOR IDENTIFICATION:	ICEA S-58-679, Method 1, Table 2 or ICEA S-58-679, Method 3, Table 2. White or green conductors shall not be provided.
FACTORY TESTS:	Insulated conductors shall meet the requirements of UL 83 for Type THHN-THWN. Assembly jacket shall meet the requirements of UL 1277. Cable shall meet the flame test requirements of UL 1277 for Type TC-ER power and control tray cable.

Cable Details

Number of Conductors	Assembly Jacket Thickness*		Maximum Outside Diameter	
	in.	μm	in.	mm
2	0.045	1140	0.46	11.68
3	0.045	1140	0.49	12.45
4	0.045	1140	0.56	14.22
5	0.045	1140	0.60	15.24
7	0.045	1140	0.66	16.76
9	0.060	1520	0.77	19.56
12	0.060	1520	0.91	23.11
19	0.060	1520	1.05	26.67
24	0.060	1520	1.22	30.99
30	0.080	2030	1.29	32.77
37	0.080	2030	1.40	35.56

*The average thickness shall be not less than that indicated above. The minimum thickness shall be not less than 80 percent of the values indicated above.

A durable marking shall be provided on the surface of the cable at intervals not exceeding 24 inches (600 mm). Marking shall include manufacturer's name, Type TC-ER, Type THWN or THHN, conductor size, number of conductors, and voltage class.

600 Volt, Multiconductor 12 AWG (4 mm^2) Control Cable (600-MULTI-THHN-THWN)

BLACK & VEATCH	Cable Data	Figure 8-16050

STANDARD SPECIFICATIONS

REFERENCE: ICEA S-93-639 (NEMA WC 74), AEIC CS-8, ICEA P-45-482.

CONDUCTOR: Concentric-lay, uncoated or coated copper, strand Class B. Normal maximum operating temperature 90°C.

CONDUCTOR SHIELD: Extruded semiconducting thermosetting material, ICEA S-93-639, Section 3.

INSULATION: Ethylene-propylene rubber, ICEA S-93-639, Section 4, not less than 115 mils (2920 μm) average thickness; 103.5 mils (2630 μm) minimum thickness.

INSULATION SHIELD: Extruded semiconducting thermosetting material, and nonembedded coated copper tape or coated copper wires, ICEA S-93-639, Section 5. Extruded material shall be tested in accordance with ICEA S-93-639 and AEIC CS-8. Shield area shall be not less than that of one helically applied 5 mil (130 μm) copper tape with a 10 percent overlap when calculated according to Formula 3 in ICEA P-45-482.

JACKET: Black polyvinyl chloride, ICEA S-93-639, Paragraph 7.1.9.

FACTORY TEST: Cable shall meet the requirements of ICEA S-93-639 and AEIC No. CS-8.

Cable Details

Size		Number of Strands	*Jacket Thickness		Maximum Outside Diameter	
AWG or kcmil	mm^2		in.	μm	in.	mm
6	16	7	0.060	1520	0.74	18.8
4	25	7	0.060	1520	0.78	19.81
2	35	7	0.060	1520	0.84	21.34
1	40	19	0.060	1520	0.88	22.35
1/0	50	19	0.060	1520	0.92	23.37
2/0	70	19	0.080	2030	1.01	25.65
4/0	95	19	0.080	2030	1.12	28.45
250	120	37	0.080	2030	1.18	29.97
350	185	37	0.080	2030	1.29	32.77
500	300	37	0.080	2030	1.45	36.88
750	400	61	0.080	2030	1.65	41.91
1000	500	61	0.080	2030	1.81	45.97

*The average thickness shall be not less than that indicated above. The minimum thickness shall be not less than 80 percent of the values indicated above.

The conductor shield, insulation, and insulation shield shall be applied in a triple extrusion process with all three components being cured at the same time.

The color of the insulation shall be in contrast to the color of the semiconducting paint. The semiconducting paint shall be readily removable for terminating.

A durable marking shall be provided on the surface of the cable at intervals not exceeding 24 inches (600 mm). Marking shall include manufacturer's name, insulating material, conductor size, and voltage class.

Voltage Test After Installation: DC Test Voltage - 36 kV
Duration of Test - 15 Minutes

8000 Volt, Single Conductor Power Cable
100 Percent Insulation Level (8000-1-EPR-PVC-SH)

BLACK & VEATCH	Cable Data	Figure 9-16050

STANDARD SPECIFICATIONS

REFERENCE: ICEA S-93-639 (NEMA WC 74), AEIC CS-8, ICEA P-45-482.

CONDUCTOR: Concentric-lay, uncoated or coated copper, strand Class B. Normal maximum operating temperature 90°C.

CONDUCTOR SHIELD: Extruded semiconducting thermosetting material, ICEA S-93-639, Section 3.

INSULATION: Ethylene-propylene rubber, ICEA S-93-639, Section 4, not less than 220 mils (5590 μm) average thickness; 198 mils (5030 μm) minimum thickness.

SHIELD: Extruded semiconducting thermosetting material, and nonembedded coated copper tape or coated copper wires, ICEA S-93-639, Section 5. Extruded material shall be tested in accordance with ICEA S-93-639 and AEIC CS-8. Shield area shall be not less than that of one helically applied 5 mil (130 μm) copper tape with a 10 percent overlap when calculated according to Formula 3 in ICEA P-45-482.

JACKET: Black polyvinyl chloride, ICEA S-93-639, Paragraph 7.1.9.

FACTORY TEST: Cable shall meet the requirements of ICEA S-93-639 and AEIC CS-8.

Cable Details

Size		Number of Strands	*Jacket Thickness		Maximum Outside Diameter	
AWG or kcmil	mm^2		in.	μm	in.	mm
2	35	19	0.080	2030	1.14	28.96
1	40	19	0.080	2030	1.17	29.72
1/0	50	19	0.080	2030	1.21	30.73
2/0	70	19	0.080	2030	1.25	31.75
4/0	95	19	0.080	2030	1.30	33.02
250	120	37	0.080	2030	1.43	36.32
350	185	37	0.080	2030	1.53	38.86
500	300	37	0.080	2030	1.66	42.16
750	400	61	0.110	2790	1.95	49.53
1000	500	61	0.110	2790	2.19	55.63

*The average thickness shall be not less than that indicated above. The minimum thickness shall be not less than 80 percent of the values indicated above.

The conductor shield, insulation, and insulation shield shall be applied in a triple extrusion process with all three components being cured at the same time.

The color of the insulation shall be in contrast to the color of the semiconducting paint. The semiconducting paint shall be readily removable for terminating.

A durable marking shall be provided on the surface of the cable at intervals not exceeding 24 inches (600 mm). Marking shall include manufacturer's name, insulating material, conductor size, and voltage class.

Voltage Test After Installation: DC Test Voltage - 53 kV
Duration of Test - 15 Minutes

15,000 Volt, Single Conductor Power Cable
133 Percent Insulation Level (15-1-EPR-PVC-SH)

BLACK & VEATCH	Cable Data	Figure 10-16050

STANDARD SPECIFICATIONS

REFERENCE: ICEA S-95-658 (NEMA WC 70).

CONDUCTOR: Concentric lay, uncoated copper; strand Class B. Normal maximum operating temperature 90°C.

INSULATION: Cross-linked thermosetting polyethylene, ICEA S-95-658, Paragraph 3.6.

SHIELD: None.

JACKET: Cable assembly; black, flame-retardant polyvinyl chloride, UL1277, applied over tape-wrapped cable core.

FACTORY TEST: Cable shall meet the requirements of ICEA S-95-658, UL1277 and IEEE Standard 1202 ribbon burner flame test.

Cable Details

Size		Number of Strands	*Conductor Insulation Thickness		**Assembly Jacket Thickness		Maximum Outside Diameter	
AWG or kcmil	mm^2		in.	mm	in.	μm	in.	mm
12	4	7	0.030	0.76	0.045	1140	0.46	11.68
10	6	7	0.030	0.76	0.045	1140	0.51	12.95
8	10	7	0.045	1.14	0.060	1520	0.68	17.27
6	16	7	0.045	1.14	0.060	1520	0.76	19.30
4	25	7	0.045	1.14	0.060	1520	0.91	23.11
2	35	7	0.045	1.14	0.060	1520	1.03	26.16
1	40	19	0.055	1.40	0.080	2030	1.16	29.46
1/0	50	19	0.055	1.40	0.080	2030	1.26	32.00
2/0	70	19	0.055	1.40	0.080	2030	1.36	34.54
4/0	95	19	0.055	1.40	0.080	2030	1.60	40.64

*The average thickness shall be not less than indicated above. The minimum thickness shall be not less than 90 percent of the values indicated above.

**The average thickness shall be not less than indicated above. The minimum thickness shall be not less than 80 percent of the values indicated above.

A durable marking shall be provided on the surface of the cable at intervals not exceeding 24 inches (600 mm). Marking shall include manufacturer's name, XLP, XHHW-2, Type TC-ER, conductor size, and voltage class.

600 Volt, 3 Conductor With Ground Power Tray Cable (600-3-XLP-PVC-TC)

BLACK & VEATCH	Cable Data	Figure 11-16050

STANDARD SPECIFICATIONS

REFERENCE: ICEA S-95-658 (NEMA WC 70).

CONDUCTOR: Concentric-lay, uncoated copper; strand Class B. Wet/dry maximum operating temperature 90°C.

INSULATION: Cross-linked thermosetting polyethylene, ICEA S-95-658, Paragraph 3.6.

SHIELD: None.

JACKET: None.

FACTORY TESTS: Cable shall meet the requirements of ICEA S-95-658, UL and IEEE Standard 1202 ribbon burner flame tests.

Cable Details

Size		Number of Strands	Conductor Insulation Thickness*		Maximum Outside Diameter	
AWG or kcmil	mm^2		in.	μm	in.	mm
250	120	37	0.065	1650	0.72	18.29
350	185	37	0.065	1650	0.83	21.08
500	240	37	0.065	1650	0.95	24.13
750	400	61	0.080	2030	1.17	29.72
1000	500	61	0.080	2030	1.35	34.29

*The average thickness shall be not less than indicated above. The minimum thickness shall be not less than 90 percent of the values indicated above.

A durable marking shall be provided on the surface of the cable at intervals not exceeding 24 inches (600 mm). Marking shall include manufacturer's name, VW-1, XHHW-2, Type TC-ER, conductor size, and voltage class.

600 Volt, Single Conductor Power Tray Cable
(600-1-VW-1-NONE-XHHW-2-TC)

BLACK & VEATCH	Cable Data	Figure 12-16050

STANDARD SPECIFICATIONS

REFERENCE: ICEA S-95-658 (NEMA WC 70).

CONDUCTOR: Concentric-lay, uncoated copper; strand Class B. Normal maximum operating temperature 90°C.

INSULATION: Cross-linked thermosetting polyethylene, ICEA S-95-658, Paragraph 3.6.

SHIELD: None.

JACKET: None.

FACTORY TESTS: Cable shall meet the requirements of ICEA S-95-658.

Cable Details

Size		Number of Strands	Conductor Insulation Thickness*		Maximum Outside Diameter	
AWG or kcmil	mm^2		in.	μm	in.	mm
14	2.5	7	0.045	1140	0.19	4.83
12	4.0	7	0.045	1140	0.22	5.59
10	6.0	7	0.045	1140	0.24	6.10
8	10.0	7	0.060	1520	0.31	7.87
6	16.0	7	0.060	1520	0.35	8.89
4	25.0	7	0.060	1520	0.39	9.91
2	35.0	7	0.060	1520	0.46	11.68
1	40.0	19	0.080	2030	0.54	13.72
1/0	50.0	19	0.080	2030	0.59	14.99
2/0	70.0	19	0.080	2030	0.63	16.00
4/0	95.0	19	0.080	2030	0.74	18.80
250	120.0	37	0.095	2410	0.82	20.83
350	185.0	37	0.095	2410	0.91	23.11
500	300.0	37	0.095	2410	1.04	26.42
750	400.0	61	0.110	2790	1.28	32.51
1,000	500.0	61	0.110	2790	1.44	36.58

*The average thickness shall be not less than that indicated above. The minimum thickness shall be not less than 80 percent of the values indicated above.

A durable marking shall be provided on the surface of the cable at intervals not exceeding 24 inches (600 mm). Marking shall include manufacturer's name, XLP, RHH or RHW or USE, conductor size, and voltage class.

600 Volt, Single Conductor Power Cable (600-1-XLP-NONE-RHH-RHW-USE)

BLACK & VEATCH	Cable Data	Figure 13-16050

STANDARD SPECIFICATIONS

REFERENCE: Type MC, UL 83 and 1569.

CONDUCTOR: Solid, uncoated copper. Maximum operating temperature 90°C dry.

INSULATION: Polyvinyl chloride, UL 83, Type THHN.

GROUND: Copper conductor sized per NEC with green THHN insulation.

JACKET: Conductor: Nylon.

ARMOR: Galvanized interlocked steel.

FACTORY TESTS: Conductors shall meet the requirements of UL 83 for Type THHN. Assembly shall meet the requirements of UL 1569 for Type MC.

Cable Details

Size					Nominal Outside Diameter	
AWG or kcmil	**mm^2**	**Number of Conductors**	**Ground Size (AWG)**	**Number of strands per conductor**	**in.**	**mm**
12	4.0	2	12	1	0.492	12.50
12	4.0	3	12	1	0.531	13.49
12	4.0	4	12	1	0.579	14.71
10	6.0	2	10	1	0.562	14.27
10	6.0	3	10	1	0.610	15.49
10	6.0	4	10	1	0.641	16.28

600 Volt, Type MC Metal Clad Lighting Cable (Metal Clad THHN)

BLACK & VEATCH	Cable Data	Figure 14-16050

STANDARD SPECIFICATIONS

REFERENCE: ICEA S-95-658 (NEMA WC 70).

CONDUCTOR: Stranded, uncoated copper. Maximum operating temperature 90°C.

INSULATION: Cross-linked polyethylene, ICEA S-95-658.

GROUND: Copper conductor sized per NEC with green insulation.

SHIELD: Cable assembly: Copper tape or aluminum foil-polyester tape, shield applied to achieve 100 percent cover over insulated conductors.

JACKET: Cable assembly: Black, flame-retardant polyvinyl chloride, UL 1277, applied over tape-wrapped cable core.

FACTORY TEST: Cable shall meet the requirements of ICEA S-95-658, UL1277 and IEEE Standard 1202 ribbon burner flame test.

Cable Details

Size		Number of Strands	*Conductor Insulation Thickness		**Assembly Jacket Thickness		Maximum Outside Diameter	
AWG or kcmil	mm^2		in.	mm	in.	μm	in.	mm
12	4	7	0.060	1.52	0.060	1520	0.66	16.80
10	6	7	0.060	1.52	0.060	1520	0.71	18.14
8	10	7	0.070	1.78	0.060	1520	0.93	23.74
6	16	7	0.070	1.78	0.080	2030	1.04	26.40
4	25	7	0.070	1.78	0.080	2030	1.21	30.67
2	35	7	0.070	1.78	0.080	2030	1.35	34.40
1	40	7	0.070	1.78	0.080	2030	1.35	34.40
1/0	50	19	0.090	2.29	0.080	2030	1.70	43.07
2/0	70	19	0.090	2.29	0.080	2030	1.77	44.94
4/0	95	19	0.090	2.29	0.110	2800	2.02	51.34
250	120	37	0.105	2.67	0.110	2800	2.30	58.49
350	185	37	0.105	2.67	0.110	2800	2.63	66.70
500	300	37	0.105	2.67	0.110	2800	3.12	79.26

*The average thickness shall be not less than indicated above. The minimum thickness shall be not less than 90 percent of the values indicated above.

**The average thickness shall be not less than indicated above. The minimum thickness shall be not less than 80 percent of the values indicated above.

A durable marking shall be provided on the surface of the cable at intervals not exceeding 24 inches (600 mm). Marking shall include manufacturer's name, XLP, RHW, Type TC-ER, conductor size, and voltage class.

2000 Volt, 3 Conductor Adjustable Frequency Drive Cable (2000-3-AFD-XLP-PVC-SH-TC)

BLACK & VEATCH	Cable Data	Figure 15-16050

Project and Location _____ Project No. _____
Circuit Designation _____ Date _____

DC TEST DATA

Time in Minutes After 100% Test Voltage Is Applied	Current, µA		
	Phase A	Phase B	Phase C
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
kV dc after 1 min Decay			

DC Test Voltage _____

Cable Installation: New ____ Used ___ Years____

Cable: Size _____ Length: _____

Oper. kV _____ Grounded _____ Ungrounded_____

Rated Cable Voltage _____

Insulation Wall _____
(Type & Thickness)

Conductor Jacket Wall _____
Type & Thickness)

Shield _____
(Type)

Cable Manufacturer _____

Temperature _____ Humidity_____

Type of Termination _____

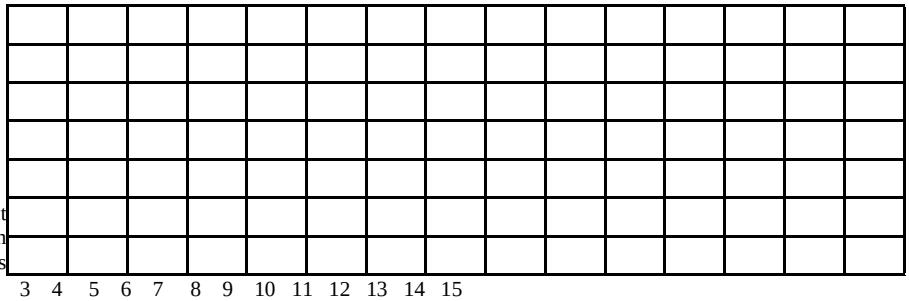
Type of Splice & Location_____
_____

Remarks_____

100 Microamperes (µA) = 0.1 Milliampere

APPLICATION OF TEST VOLTAGE
The initially applied direct-current voltage shall be not greater than 3.0 times the rated alternating-current voltage. The rate of increase from the initially applied voltage to the specified test voltage shall be not over 100 percent in 10 seconds nor less than 100 percent in 60 seconds. The duration of the direct-current voltage test shall be 15 minutes for shielded cables and 5 minutes for nonshielded cables.

Test Curve



NOTES:
1. Plot results of tests on all three phases on this graph.
2. Assign and indicate values for each division on the microamperes scale as required for the circuit being tested.

Cable Test Data Form

BLACK & VEATCH	**Cable Data**	**Figure 16-16050**

SECTION 16100 - ELECTRICAL EQUIPMENT INSTALLATION

PART 1 - GENERAL

1.1 SCOPE

A. This section covers the installation of electrical equipment.

1.2 GENERAL

A. Equipment specified to be installed under this section shall be erected, and placed in proper operating condition in full conformity with Drawings, Specifications, engineering data, instructions, and recommendations of the equipment manufacturer, unless exceptions are noted by Engineer.

B. The electrical equipment identified as being provided by others will be furnished complete for installation by Contractor. Technical specifications under which the equipment will be purchased are available.

C. Coordination

1. When manufacturer's field services are provided by the equipment manufacturer, Contractor shall coordinate the services with the equipment manufacturer. Contractor shall give Engineer written notice at least 14 days prior to the need for manufacturer's field services furnished by others.

2. Submittals for equipment furnished under the original procurement contract will be furnished to Contractor upon completion of review by Engineer. Contractor shall review equipment submittals and coordinate with the requirements of the Work and the Contract Documents. Contractor accepts sole responsibility for determining and verifying all quantities, dimensions, and field construction criteria.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Delivery

1. When sills are required for electrical equipment, they shall be shipped ahead of the scheduled equipment delivery to permit installation before concrete is placed.

B. Storage

1. Upon delivery, all equipment and materials shall immediately be stored and protected by Contractor in accordance with Product Storage and Handling Requirements section, and in accordance with manufacturer's written instructions, until installed in the Work.

Equipment shall be protected by Contractor against damage and exposure from the elements. At no time shall the equipment be stored on earth or grass surfaces or come into contact with earth or grass. Contractor shall keep the equipment clean and dry at all times. Openings shall be plugged or capped (or otherwise sealed by packaging) during temporary storage.

C. Handling

1. Electrical equipment shall be moved by lifting, jacking, or skidding on rollers as described in the manufacturer's instructions. Special lifting harness or apparatus shall be used when required. Lifting and jacking points shall be used when identified on the equipment. Contractor shall have required unloading equipment on site to perform unloading work on the date of equipment delivery.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

3.1 INSTALLATION, TESTING, AND COMMISSIONING

A. All installation work shall be in accordance with manufacturer's written instructions.

B. All material, equipment, and components specified to be installed according to this section shall be installed, tested, and commissioned for operation in compliance with NECA 1000 – NEIS Specification System. Where required in NECA 1000, testing and commissioning procedures shall be followed prior to energizing equipment.

C. Electrical equipment cubicles and vertical sections shall be installed plumb and level. Drawout equipment carriages, circuit breakers, and other removable components shall operate free and easy without binding or distortion.

D. Unless otherwise indicated or specified, all indoor floor-mounted electrical equipment and control cabinets shall be installed on concrete equipment pads four inches in height.

E. Indoor metal-clad switchgear shall be bolted to steel floor channels which are installed level and flush with the top of the concrete floor or equipment pad.

F. Outdoor metal-clad switchgear and interrupter gear with integral floor channels or beams shall be secured to concrete pads with anchor bolts and clips.

G. Motor control centers with integral floor sills shall be secured to concrete floors or equipment pads with anchor bolts.

H. Adequate bracing shall be provided for seismic forces. The bracing shall be designed to meet the requirements of the Meteorological and Seismic Design Criteria section.

I. Cleaning

1. All deposits of oil, grease, mud, dirt or debris shall be cleaned from the electrical equipment following installation and field wiring. A detergent water based solution, or other liquid cleaners not harmful to material or equipment finishes, shall be used as recommended by the manufacturer.

End of Section

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