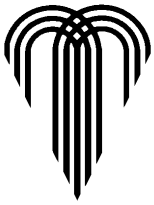


City of Kansas City, Missouri
Water Services Department
Kenneth Morgan, P.E., Director

Project Manual

FOR

PROJECT/CONTRACT NO. 81000713/1673

INLINE STORAGE: OK CREEK GATES-BENDING WEIR

BIDDER/ADDRESS

Company _____
Contact _____
Address _____
_____
Phone _____
Email _____
_____

Project Manager: Kyle Tonjes, P.E.
Telephone: 816-601-2531
Email: kltonjes@burnsmcd.com

CITY OF FOUNTAINS
HEART OF THE NATION

KANSAS CITY
MISSOURI

CERTIFICATION PAGE

Project/Contract Number 81000713 / 1673

Project Title Inline Storage: OK Creek Gates-Bending Weir

I am responsible for the following specifications and drawings:

Specifications: DIV 00, DIV 01 (except 01015, 01550, 01570), 02624, 02702, 03370, 05010

STATE OF MISSOURI
PHILLIP A SHIVELY
NUMBER PE-2003001099
PROFESSIONAL ENGINEER

1/21/2025

(SEAL)

I certify under penalty of law that the document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted, and that the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

CERTIFICATION PAGE

Project/Contract Number: 81000713/1673

Project Title: OK Creek Bending Weir Project

I am responsible for the following specifications and drawings:

Drawings:	Specifications:
G-00-000, G-00-001, G-00-002, G-00-003, M-10-101, M-10-102, M-10-301, M-20-101, M-20-301, M-31-101	01015, 09940, 11319, 15020, 15061, 15067, 15091, 15102, 15108, 15111, 15114, 15121, 15140, 15180

(SEAL)

Chris. L. Ramsey

I am responsible for the following specifications and drawings:

Drawings:	Specifications:
S-00-000, S-00-001, S-99-501, S-99-502, S-99-503, S-99-504, S-99-505	03100, 03200, 03250, 03300, 03330, 03350, 03390, 03600, 03920, 03930, 05520, 05530, 05550, 05590

(SEAL)

Martin Z. Li

CERTIFICATION PAGE

Project/Contract Number: 81000713/1673

Project Title: OK Creek Bending Weir Project

I am responsible for the following specifications and drawings:

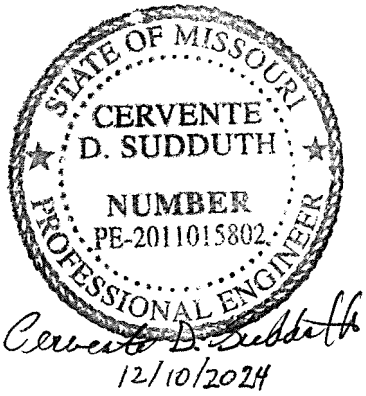
Drawings:	Specifications:
E-00-001, E-00-002, E-10-101, E-20-101, E-99-501, E-99-701, I-00-001, I-10-701, I-20-701, I-99-501	13500, 13530, 13550, 13562, 13563, 16050, 16100, 16220, 16670

(SEAL)

Bryan D. Quarles

I am responsible for the following specifications and drawings:

Drawings:	Specifications:
S-00-002, S-10-101, S-10-102, S-10-103, S-10-104, S-10-301, S-10-302, S-10-303, S-10-304, S-10-401, S-10-402, S-10-403, S-10-501, S-10-502, S-10-503, S-10-901, S-20-101	None.



(SEAL)

Cervente D. Sudduth

I am responsible for the following specifications and drawings:

CERTIFICATION PAGE

Project/Contract Number: 81000713/1673

Project Title: OK Creek Bending Weir Project

Drawings:	Specifications:
C-31-100, C-31-101, C-31-102, C-31-103, C-71-101, C-71-102, C-99-501, C-99-502, D-10-101	01550, 01570, 02050, 02202, 02260, 02514, 02522, 02704, 02930

(SEAL)

Justin W. Likes

I certify under penalty of law that the document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted, and that the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

CITY OF FOUNTAINS
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Project/Contract Number: 81000713 / 1673

Project Title: Inline Storage: OK Creek Gates-Bending Weir

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00410.01 Experience Reference Form
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LIST OF DRAWINGS

Project Number 81000713

Project Title Inline Storage: OK Creek Gates-Bending Weir

Item	Set /Title /Description /Designation	Drawing No(s).	Dated
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002	CERTIFICATION SHEET	1004.10	12/2024
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015	ABBREVIATIONS AND LEGENDS	1004.10	12/2024
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021	SECTIONS 1 OF 2	1004.10	12/2024
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034	STD CONCRETE REINF DETAILS	1004.10	12/2024
035	GUARDRAIL & HANDRAILING DETAILS	1004.10	12/2024
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037	TYPICAL CONCRETE CRACK AND SURFACE REPAIR DETAILS AND NOTES	1004.10	12/2024

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043	RECIRCULATION CLEAN-OUT MANHOLE PLANS AND SECTIONS	1004.10	12/2024
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CITY OF FOUNTAINS
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INVITATION TO BID

Project Number 81000713

Project Title Inline Storage: OK Creek Gates-Bending Weir

The Water Services Department of Kansas City, Missouri will receive sealed Bids until 2:00 PM, on February 18, 2025 at Water Services Department Bldg located at 4800 East 63rd Street, Kansas City, MO 64130 for *Project No. 81000713 Inline Storage: OK CREEK Gates-Bending Weir*. Bids will be opened after that time in a Water Services Conf room TBD the day of.

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.

Project Manager: Kyle Tonjes
Phone Number: 816-601-2531
E-mail: kltonjes@burnsmcd.com

Contract Administrator: Jamie Driskell
Phone Number: 816-652-2927
E-mail: jdriskell@burnsmcd.com

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

CITY OF FOUNTAINS
HEART OF THE NATION

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INSTRUCTIONS TO BIDDERS

Project Number 81000713

Project Title Inline Storage: OK Creek Gates-Bending Weir

1. Sealed Bids for **Inline Storage: OK Creek Gates-Bending Weir PN#81000713** will be received by the Water Services Department at 4800 East 63rd Street, Kansas City, MO 64130 until 2:00 P.M., February 18, 2025, 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 Director of Water Services, 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. KCMO Preliminary Vendor Security Questionnaire - Form 1 and 2

w. Fully executed Affidavit of Compliance with the Federal Consent Decree regarding the City of Kansas City, Missouri Overflow Control Plan ("OCP") Civil Action No. 4:10-cv-0497-GAF.

x. Other.

4. Waiver of Bid Requirements The Director of Water Services 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 ten (10) 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. Escalation. If during the bid review and approval of the contract, the price of material increases, through no fault of the Contractor, the contract price may be equitably adjusted and subject to escalation. Escalation will be based on cost increases without additional profit, overhead or margin, and shall include material costs only that occur between the bid date and within the 90 day period immediately following the Notice to Proceed date. Such price increases shall be documented through third party sources. See Section 00700, Article 11 and Section 00800 Article 11, Paragraph 11.01.F. for additional information.

12. 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

13. 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.

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 Reporting System for all applicable personnel and shall require subcontractors to submit same.

19. 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.

20. 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 CREO KC 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.

21. 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.

22. 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 00460 CREO KC Timetable for MBE WBE Utilization (CREO KC Form 10); 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.

23. 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.

24. 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.

25. 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 AM to 3:00 PM each day Monday through Friday (holidays excepted). Bidders may contact the following individual from the Water Services Department for an appointment.

Contact: David Elge

Phone: (816) 209-8850 E-mail: David.Elge@kcmo.org

26. 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.

27. Forward all questions in writing to the following Project Manager and Contract Administrator. Questions received less than seven (7) 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.

Kyle Tonjes, P.E., Project Manager
9400 Ward Parkway
Kansas City, MO, 64114
(816) Phone Number

Jamie Driskel, Contract Administration
9400 Ward Parkway
Kansas City, MO, 64114
(816) 652-2927

For persons with disabilities needing reasonable accommodations please contact Jean Lawson at 816-513-6566. If you need to use the Relay Service, please dial 711.

Bidder: _____

CITY OF FOUNTAINS
HEART OF THE NATION

KANSAS CITY
MISSOURI

BID FORM/CONTRACT

Project/Contract Number 81000713 / 1673

Project Title Inline Storage: OK Creek Gates – Bending Weir

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.

A. LUMP SUM BID IN NUMERIC FIGURES FOR CONSTRUCTION OF BENDING WEIR AND OK CREEK BOX CULVERT MODIFICATIONS:

$_____

B. LUMP SUM BID IN NUMERIC FIGURES FOR ROCK BOX AND TURKEY CREEK PUMP STATION MODIFICATIONS:

$_____

C. ALLOWANCE: $ **200,000.00**

TOTAL LUMP SUM PROJECT BID IN NUMERIC FIGURES (SUM OF A + B + C):

$_____

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. Form(s) 00411 Itemized Prices, contain prices included in the Base Bid, and are incorporated into this Bid. Form(s) must be completed and returned with this Bid.
    a. The itemized prices provided for in this Bid Form shall apply only in the event of a Change Order providing for such increase or decrease in the quantities.
    b. The Contract Price will be subject to adjustment according to final measured, used, or delivered quantities, and the adjustment unit prices in the Bid will apply to such final quantities
9. Form 00413 Allowances contain prices included in the Base Bid, and are incorporated into this Bid. The Form must be completed and returned with this Bid.
10. The undersigned Bidder acknowledges receipt of the following addenda listed by number and date appearing on each addendum:

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

11. 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 (City Code Section 3-515). Within forty-eight (48) hours after bid opening, the construction contractor shall submit **00485.04 Employee Identification Report Form-Rev. 102715** which shall include: the name, home address, job title, sex and race/ethnicity of each person the contractor anticipates will be performing construction labor hours creditable towards the minimum workforce goals applicable to the construction contractor individually. 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.

12. 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.

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

14. 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** **0% DBE**

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

15. 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)

16. 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.**

17. 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.

Bidder: _____

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:

00413 Allowances, included in the Bid, a copy of which is attached

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 Number: _____

Project Title: _____

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				
9				
10				

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 Number: _____

Project Title: _____

	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.		

Bidder: _____

CITY OF FOUNTAINS
HEART OF THE NATION

KANSAS CITY
MISSOURI

ALLOWANCE FORM

Project Number: 81000713

Project Title: Inline Storage: OK Creek Gates-Bending Weir

Allowance No.:	Allowance Description:	Allowance in Figures:
1	General Allowance for items of work not specified in the Plans or Project Manual	$200,000.00

CITY OF FOUNTAINS
HEART OF THE NATION

KANSAS CITY
MISSOURI

BID BOND

Project Number _____

Project Title _____

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 _____

Project Title _____

_____ _____
(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 _____

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)

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

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.

Director
CREO KC Department
414 E. 12th Street, 4th Floor
Kansas City, MO 64106
Phone: 816-513-1836
FAX: 816-513-1805

Narrative: _____

Report Submitted By: _____ **Date** _____

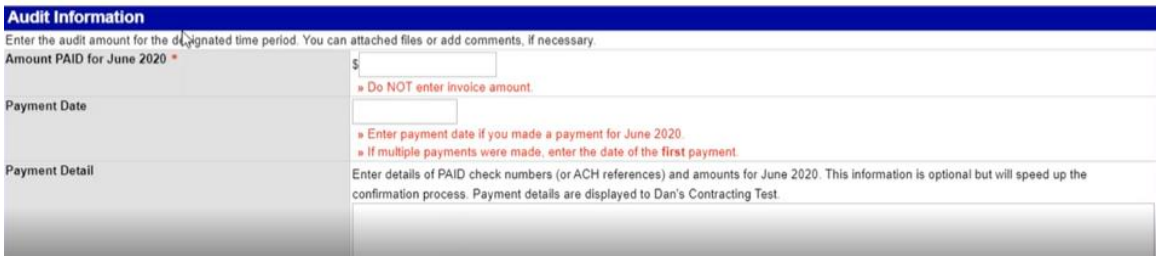
REMINDER: CONTRACTOR is responsible for meeting or exceeding the the D/M/WBE participation amounts in its Contractor Utilization Plan (CUP) as amended by any previously approved Request for Modification/Substitution. Any Change Orders or amendements modifying the amount CONTRACTOR is to be compensated 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:

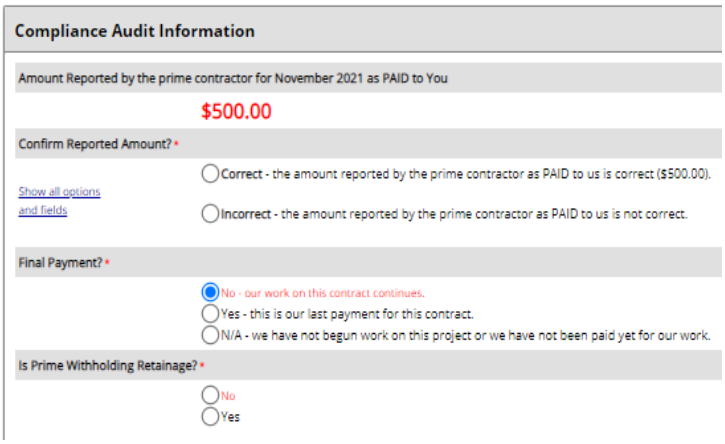


Once information has been entered, select review and save. Complete same steps for all subcontractors. If there were subcontractors that did not receive a payment for the specific audit month, click the Mark Remaining Subcontractors as Zero button to mark remaining subcontractors as 0.

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.

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

Report Submitted By: _____

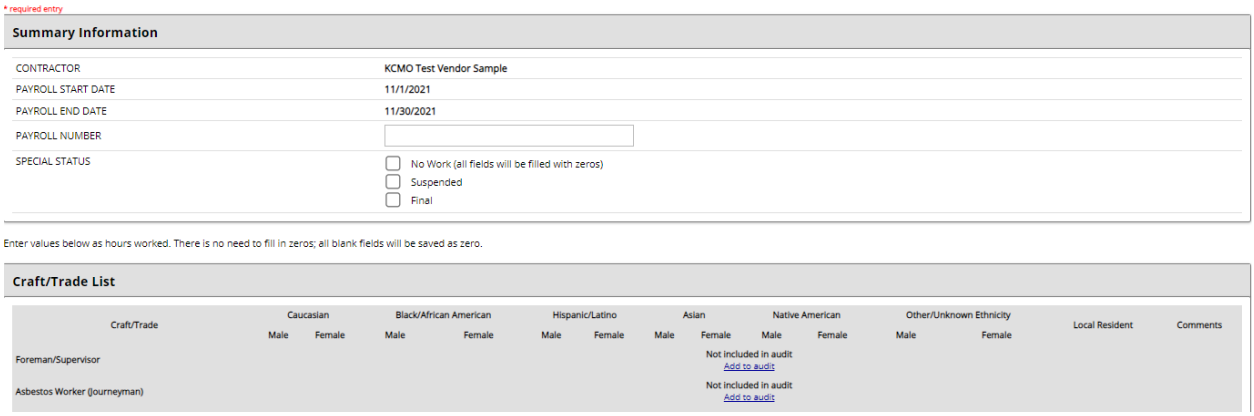
Date: _____

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														
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														
Total Monthly Hours														-
Total % of Hours														

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

Director CREO KC 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								
1										
2										
3										
4										
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12										
13										
14										

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								
15										
16										
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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								
48										
49										
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80										

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								
81										
82										
83										

CITY OF FOUNTAINS
HEART OF THE NATION

KANSAS CITY
MISSOURI

Pre Contract Bidder's Certification

Project Number _____

Project Title _____

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, 2024.

CITY OF FOUNTAINS
HEART OF THE NATION

KANSAS CITY
MISSOURI

CONTRACT REQUIRED SUBMISSIONS

Project/Contract Number:_____

Project/Contract Title/Description: _____

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
  4800 East 63rd Street
  Kansas City, Missouri 64130

- ☐ 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 USB drive.

Affidavit of Compliance With the Federal Consent Decree Regarding the City of Kansas City, Missouri Overflow Control Plan ("OCP")

Civil Action No. 4:10-cv-0497-GAF

STATE OF MISSOURI)

) ss.

COUNTY OF)

I, _____, having full authority to act on behalf of _____, do solemnly swear under oath to the following:

I certify, under penalty of law, that the City has made an electronic copy of this Consent Decree available to this organization at the following web location: https://www.kcsmartsewer.us/home/showpublisheddocument/6428/637534718121930000. I further certify that the Consent Decree, along with appendices, have been reviewed in their entirety and that said review has been performed under my direction or supervision in accordance with a system designed to assure that qualified personnel properly evaluated and fully understand the information contained in this Consent Decree upon execution of any contract relating to such work, including, but not limited to, subcontractors, equipment providers, material suppliers, or sub-consultants.

_____

Signature of affiant

On this ____ day of _____, _____ before me, _____, a Notary Public in and for said state, personally appeared ( ), known to me to be the person who executed the within affidavit, and acknowledge to me that he/she executed the same for the purposes therein stated.

_____

Notary Public

My commission expires: _____

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
Water Services Department of Kansas City, Mo.			1 2 4 9 0 4 6 6
Address	**City**	**State**	**ZIP Code**
4800 E 63rd St	Kansas City	Mo	64130
E-mail Address			
Shericka.Slack@kcmo.org			
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)
	Shericka Slack	___ ___ / ___ ___ / ___ ___ ___ ___

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 Number _____

Project Title _____

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_____ 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 Number _____

Project Title _____

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 _____, 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

SAMPLE

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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

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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

OVERFLOW CONTROL PLAN CONSENT DECREE SUPPLEMENTARY CONDITIONS

Project Number: 81000713, Contract Number: 1673

Project Title: Inline Storage: OK Creek Gates – Bending Weir

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-2.04 A. Article 2, Paragraph 2.04, Copies of Documents, is amended by deleting Paragraph 2.04 A and replacing it with the following:

A. CITY shall furnish to CONTRACTOR one executed copy of the Project Manual including all Addenda.

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:

1. Report dated April 14, 2005, prepared by KTI of Lenexa, KS; entitled *Report of Geotechnical Exploration, Pump Station Phase II, Turkey Creek Pump Station, Kansas City, Missouri*, along with Appendices, which has been posted to the planroom. This report is for the bidders information only and is not a part of the contract documents.

In the preparation of the Contract Documents, no drawings of physical conditions in or relating to existing surface or subsurface structures which are at or contiguous to the Site of the Work are available.

SC-4.06 Article 4, Paragraph 4.06, Asbestos, Lead-Based Paint, PCBs, Petroleum, Hazardous 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 are available.

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 **three (3) years** after the date when Achievement of Full Operation (AFO) is granted by the City, 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:

Burns & McDonnell Engineering Company, Inc.

Black and Veatch

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 fourteen (14) days prior to Bid date at the following address:

Smart Sewer Program Management Team
Burns & McDonnell
9400 Ward Pkwy
Kansas City, MO 64114
Attn: Kyle Tonjes, P.E., Project Manager

kltonjes@burnsmcd.com

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 28 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-6.10. 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

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.

SC-6.10. 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-9.02 Article 9, Paragraph 9.02, Resident Project Representative is amended by adding the following new Subparagraphs immediately following Subparagraph 9.02 A:

B. The Resident Project Representative (RPR) will be DESIGN PROFESSIONAL's representative at the Site, will act as directed by and under the supervision of DESIGN PROFESSIONAL, and will confer with DESIGN PROFESSIONAL regarding RPR's actions.

1. General: RPR's dealings in matters pertaining to the Work in general shall be with DESIGN PROFESSIONAL, the CITY's Smart Sewer Program Manager, and CONTRACTOR. RPR's dealings with Subcontractors shall only be through or with the full knowledge and approval of CONTRACTOR. RPR shall generally communicate with CITY and CITY'S Smart Sewer Program Manager only with the knowledge of and under the direction of DESIGN PROFESSIONAL.

2. Schedules: Review the progress schedule, schedule of Shop Drawing and Sample submittals, and Schedule of Values prepared by CONTRACTOR and consult with DESIGN PROFESSIONAL and CITY'S Smart Sewer Program Manager concerning acceptability.

3. Conferences and Meetings: Attend meetings with CONTRACTOR and CITY's Smart Sewer Program Manager, such as preconstruction conferences, progress meetings, job conferences, and other Project-related meetings.

4. Liaison:

    a. Serve as DESIGN PROFESSIONAL's liaison with CONTRACTOR. Working principally through CONTRACTOR's authorized representative or designee, assist in providing information regarding the provisions and intent of the Contract Documents.

    b. Assist DESIGN PROFESSIONAL in serving as CITY's liaison with CONTRACTOR when CONTRACTOR's operations affect CITY's on-Site operations.

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

5. Interpretation of Contract Documents: Report to DESIGN PROFESSIONAL when clarifications and interpretations of the Contract Documents are needed and transmit to CONTRACTOR clarifications and interpretations as issued by DESIGN PROFESSIONAL.

6. Shop Drawings and Samples:

    a. Record date of receipt of Samples and CONTRACTOR-approved Shop Drawings when hard copies are furnished at the Site.

    b. Receive Samples which are furnished at the Site by CONTRACTOR, and notify DESIGN PROFESSIONAL of availability of Samples for examination.

    c. Advise DESIGN PROFESSIONAL and CONTRACTOR of the commencement of any portion of the Work requiring a Shop Drawing or Sample submittal for which RPR believes that the submittal has not been approved by DESIGN PROFESSIONAL.

7. Modifications: Consider and evaluate CONTRACTOR's suggestions for modifications in Drawings or Specifications and report such suggestions, together with RPR's recommendations, if any, to DESIGN PROFESSIONAL and CITY'S Smart Sewer Program Manager. Transmit to CONTRACTOR in writing decisions as issued by DESIGN PROFESSIONAL.

8. Review of Work and Rejection of Defective Work:

    a. Conduct on-Site observations of CONTRACTOR's work in progress to assist DESIGN PROFESSIONAL and CITY's Smart Sewer Program Manager in determining if the Work is in general proceeding in accordance with the Contract Documents.

    b. Report to DESIGN PROFESSIONAL and CITY'S Smart Sewer Program Manager whenever RPR believes that any part of CONTRACTOR's work in progress is defective, will not produce a completed Project that conforms generally to the Contract Documents, or will imperil the integrity of the design concept of the completed Project as a functioning whole as indicated in the Contract Documents, or has been damaged, or does not meet the requirements of any inspection, test or approval required to be made; and advise DESIGN PROFESSIONAL and CITY'S Smart Sewer Program Manager of that part of work in progress that RPR believes should be corrected or rejected or should be uncovered for observation, or requires special testing, inspection or approval. If RPR believes a Notice of Non-conformance should be issued, the RPR will advise the DESIGN PROFESSIONAL and CITY'S Smart Sewer Program Manager in this matter and provide field information as required for the DESIGN PROFESSIONAL and CITY'S Smart

Sewer Program Manager to complete and issue a Notice of Non-Conformance to the CONTRACTOR.

9. Inspections, Tests, and System Start-ups:
    a. Verify that tests, equipment, and systems start-ups and operating and maintenance training are conducted in the presence of appropriate CITY's personnel, and that CONTRACTOR maintains adequate records thereof.
    b. Observe, record, and report to DESIGN PROFESSIONAL and CITY'S Smart Sewer Program Manager appropriate details relative to the test procedures and systems start-ups.
10. Records:
    a. Prepare a daily report or keep a diary or log book, recording CONTRACTOR's hours on the Site, Subcontractors present at the Site, weather conditions, data relative to questions of Change Orders, Field Orders, Work Change Directives, or changed conditions, Site visitors, deliveries of equipment or materials, daily activities, decisions, observations in general, and specific observations in more detail as in the case of observing test procedures; and send copies to DESIGN PROFESSIONAL and CITY'S Smart Sewer Program Manager.
    b. Maintain records for use in preparing Project documentation.
11. Reports:
    a. Furnish to DESIGN PROFESSIONAL and CITY'S Smart Sewer Program Manager periodic reports as required of progress of the Work and of CONTRACTOR's compliance with the Progress Schedule and schedule of Shop Drawing and Sample submittals.
    b. Recommend to DESIGN PROFESSIONAL and CITY'S Smart Sewer Program Manager proposed Change Orders, Work Change Directives, and Field Orders. Assist DESIGN PROFESSIONAL as necessary in drafting such documents and obtain backup material from CONTRACTOR.
    c. Immediately notify DESIGN PROFESSIONAL and CITY'S Smart Sewer Program Manager of the occurrence of any Site accidents, emergencies, acts of God endangering the Work, force majeure or delay events, damage to property by fire or other causes, or the discovery of any Constituent of Concern or Hazardous Environmental Condition.
12. Payment Requests: Review applications for payment with CONTRACTOR for compliance with the established procedure for their submission and forward with recommendations to DESIGN PROFESSIONAL, noting particularly the relationship of the payment requested to the Schedule of Values, Work completed, and materials and equipment delivered at the Site but not incorporated in the Work.
13. Certificates, Operation and Maintenance Manuals: During the course of the Work, verify that materials and equipment certificates, operation and maintenance manuals and other data required by the Contract Documents to be assembled and furnished by CONTRACTOR are applicable to the items actually installed and in accordance with the Contract Documents, and have these documents delivered to DESIGN PROFESSIONAL for review and forwarding to CITY prior to payment for that part of the Work.

14. Completion:

    a. Participate in DESIGN PROFESSIONAL's and CITY'S Smart Sewer Program Manager visits to the Site to determine Substantial Completion, assist in the determination of Substantial Completion and the preparation of a punch list of items to be completed or corrected.

    b. Participate in DESIGN PROFESSIONAL's and CITY'S Smart Sewer Program Manager final visit to the Site to determine completion of the Work, in the company of CITY and CONTRACTOR, and prepare a final punch list of items to be completed and deficiencies to be remedied.

    c. Observe whether all items on the final list have been completed or corrected and make recommendations to DESIGN PROFESSIONAL concerning acceptance and issuance of the notice of acceptability of the work.

C. The RPR shall not:

1. Authorize any deviation from the Contract Documents or substitution of materials or equipment (including "or-equal" items).
2. Exceed limitations of DESIGN PROFESSIONAL's authority as set forth in the Contract Documents.
3. Undertake any of the responsibilities of CONTRACTOR, Subcontractors, or Suppliers.
4. Advise on, issue directions relative to, or assume control over any aspect of the means, methods, techniques, sequences or procedures of CONTRACTOR's work.
5. Advise on, issue directions regarding, or assume control over security or safety practices, precautions, anprograms in connection with the activities or operations of CITY or CONTRACTOR.
6. Participate in specialized field or laboratory tests or inspections conducted off-site by others except as specifically authorized by DESIGN PROFESSIONAL.
7. Accept Shop Drawing or Sample submittals from anyone other than CONTRACTOR.
8. Authorize CITY to occupy the Project in whole or in part.

SC-9.04 Article 9, Paragraph 9.04, Rejecting Defective Work is amended by adding the following new Subparagraph immediately following Subparagraph 9.04 A:

B. When the work performed by CONTRACTOR deviates from the project's contractual requirements, the Contractor is to be notified by the DESIGN PROFESSIONAL using the Non-Conformance Notice/Defective Work Form. The DESIGN PROFESSIONAL shall complete Part 1 – Identification of the Non-Conformance Notice and/or Defective Work to provide written notice to the CONTRACTOR that the work does not meet the referenced contractual requirements. Upon receipt, CONTRACTOR shall suspend work directly related to the non-conforming work in accordance with Specification 00700 General Conditions, Article 13 – Tests and Inspections; Correction, Removal or Acceptance of Defective Work.

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 and Veatch.

Resident Project representative: TBD.

Assistant(s) to the resident Project representative: TBD.

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, and the Work shall be substantially complete, in accordance with Paragraph 14.04, within ***365 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 60 Calendar Days after the date of Substantial Completion of the Work.

C. Liquidated Damages

1. If the Work is not substantially completed, in accordance with Paragraph 14.04, on or before (date) within the period stated in Paragraph 12.01 B.1, CONTRACTOR shall pay to CITY the amount of ***two thousand dollars and no cents ($ 2,000.00)*** 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 ***five hundred dollars and no cents ($500.00)*** 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.

SC-13.03 Article 13, Paragraph 13.03, Notice of Defects is amended by adding the following new Subparagraph immediately following Subparagraph 13.03 A:

B. Once the Non-Conformance Notice Part 1 – Identification has been given to the CONTRACTOR, per Article 9, Paragraph 9.04, Subparagraph B, the CONTRACTOR shall propose their corrective action plan with a detailed description of corrective work and proposed completion schedule in writing to the DESIGN PROFESSIONAL within the time identified in Part 1 of the Non-Conformance Notice. The DESIGN PROFESSIONAL and CITY shall approve CONTRACTOR's corrective action plan prior to commencement of remedial work. The Contractor shall resubmit its corrective action plan to address review comments received from CITY and DESIGN PROFESSIONAL. The DESIGN PROFESSIONAL shall document the approved corrective action plan in Part 2 – Disposition and Corrective Action of the Notice of Non-Conformance and/or Defective Work. The DESIGN PROFESSIONAL shall then distribute the Non-Conformance Notice /

Defective Work Form to the CITY and CONTRACTOR. CONTRACTOR shall complete the corrective work in accordance with Article 13.06.

SC-13.06 Article 13, Paragraph 13.06, Correction of Removal of Defective Work is amended by adding the following new Subparagraph immediately following Subparagraph 13.06 A:

B. Once the corrective action has been taken, the DESIGN PROFESSIONAL shall verify that the agreed upon resolution has been carried out in accordance with the procedures and verification process agreed upon in Part 2 – Disposition and Corrective Action of the Non-Conformance Notice and/or Defective Work. The DESIGN PROFESSIONAL shall document how satisfactory completion of corrective action was verified in Part 3 – Verification of Corrective Action. The DESIGN PROFESSIONAL shall then distribute the Non-Conformance Notice / Defective Work Form to the CITY and CONTRACTOR.

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 on a monthly basis. 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 or Achievement of Full Operation, Subparagraph A is supplemented as follows:

A. To meet the definition of Achievement of Full Operation, the following items of the Work must be operational and ready for CITY's continuous use as intended:

- Installation of bending weir and all structural components
- Completion of all structural modifications to the OK Creek concrete box culvert
- Installation of bending weir instrumentation and OK Creek gates control system modifications.
- Completion of rock box modifications and surface restoration
- Testing of bending weir and control system modifications
- Testing of rock box modifications

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:

3. 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.

NON-CONFORMANCE NOTICE (NCN)

Project No.:	NCN No.:
Name of Responsible Contractor/Organization:	Date:
Contractor Contact Name:	Page:
Contractor Contact Phone and Email:	

STEP 1 – IDENTIFICATION		
Nonconformance Identified Via: ☐ Internal Quality Audit ☐ Shop Inspection / Testing ☐ Jobsite Inspection / Testing Jobsite Inspection Report No.: ☐ Other:		
Detailed References (Specifications, Drawings, Details, Standards, etc):		
Description of Requirement:		
Description of Defective or Nonconforming Item(s) or Requirement:		
Nonconforming Identified By (Name):	Signature:	Date (MM/DD/YYY):
Contractor **shall respond** to this Notice on or before this date (MM/DD/YYYY):		
Delivered to Contractor (Name of Recipient):	Signature:	Date (MM/DD/YYY):

Attachments for Nonconforming work? ☐ YES ☐ NO	
If YES, list attachments:	

NON-CONFORMANCE NOTICE (NCN)

STEP 2 – DISPOSITION AND CORRECTIVE ACTION		
Date of Contractor's response to this notice (MM/DD/YYY):		
Description of Proposed Corrective Action:		
Disposition: ☐ Accept As-Is ☐ Accept Pending Further Corrective Action ☐ Reject		
Accepted By (Design Professional):	Signature:	Date:
Accepted By (SSP Project Manager):	Signature:	Date:
Accepted By (Construction Manager):	Signature:	Date:

Corrective Action Attachments? ☐ YES ☐ NO	
If YES, list attachments:	

NON-CONFORMANCE NOTICE (NCN)

STEP 3 – VERIFICATION OF CORRECTIVE ACTION		
Description of how corrective action was verified:		
Corrective Action Verified By (RPR):	Signature:	Date:
Accepted/Closed By (SSP Project Manager):	Signature:	Date:

SECTION 00830

PREVAILING WAGE

1. Annual Wage Order No. 31
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

MICHAEL L. PARSON, Governor

Annual Wage Order No. 31

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
Todd Smith, Director
Division of Labor Standards

Filed With Secretary of State: **March 8, 2024**

Last Date Objections May Be Filed: **April 8, 2024**

Prepared by Missouri Department of Labor and Industrial Relations

OCCUPATIONAL TITLE	**Prevailing Hourly Rate
Asbestos Worker	$69.50
Boilermaker	$39.44*
Bricklayer-Stone Mason	$62.06
Carpenter	$64.94
Lather	
Linoleum Layer	
Millwright	
Pile Driver	
Cement Mason	$58.02
Plasterer	
Communication Technician	$62.38
Electrician (Inside Wireman)	$70.32
Electrician Outside Lineman	$61.40
Lineman Operator	
Lineman - Tree Trimmer	
Groundman	
Groundman - Tree Trimmer	
Elevator Constructor	$93.11
Glazier	$59.07
Ironworker	$70.66
Laborer	$52.42
General Laborer	
First Semi-Skilled	
Second Semi-Skilled	
Mason	$50.24
Marble Mason	
Marble Finisher	
Terrazzo Worker	
Terrazzo Finisher	
Tile Setter	
Tile Finisher	
Operating Engineer	$66.05
Group I	
Group II	
Group III	
Group III-A	
Group IV	
Group V	
Painter	$54.25
Plumber	$78.88
Pipe Fitter	
Roofer	$60.69
Sheet Metal Worker	$76.38
Sprinkler Fitter	$69.92
Truck Driver	$54.27
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.

OCCUPATIONAL TITLE	**Prevailing Hourly Rate
Carpenter	$65.11
Millwright	
Pile Driver	
Electrician (Outside Lineman)	$90.71
Lineman Operator	
Lineman - Tree Trimmer	
Groundman	
Groundman - Tree Trimmer	
Laborer	$51.85
General Laborer	
Skilled Laborer	
Operating Engineer	$60.48
Group I	
Group II	
Group III	
Group IV	
Truck Driver	$53.04
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 81000713

Project Title Inline Storage: OK Creel Gates-Bending Weir

ISSUE DATE: **2/6/2025**

Bidders are hereby notified that the Bidding and Contract Documents for the above project, for which Bids are to be received on **2/18/25**, 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 **2/25/25**.

Bidding Requirements

1. Delete and replace the following section(s):
   a. Delete Specification 00130 Invitation to Bid and replace with the following Specification 00130 Invitation to Bid, attached herein.
   b. Delete Specification 00210 Instruction to Bidders and replace with the following Specification 00210 Instruction to Bidders, attached herein.

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 Number 81000713

Project Title Inline Storage: OK Creek Gates-Bending Weir

The Water Services Department of Kansas City, Missouri will receive sealed Bids until 2:00 PM, on February 25, 2025 at Water Services Department Bldg located at 4800 East 63rd Street, Kansas City, MO 64130 for *Project No. 81000713 Inline Storage: OK Creek Gates-Bending Weir*. Bids will be opened after that time in a Water Services Conf room TBD the day of.

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.

Project Manager: Kyle Tonjes
Phone Number: 816-601-2531
E-mail: kltonjes@burnsmcd.com

Contract Administrator: Jamie Driskell
Phone Number: 816-652-2927
E-mail: jdriskell@burnsmcd.com

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

CITY OF FOUNTAINS
HEART OF THE NATION

KANSAS CITY
MISSOURI

INSTRUCTIONS TO BIDDERS

Project Number 81000713

Project Title Inline Storage: OK Creek Gates-Bending Weir

1. Sealed Bids for **Inline Storage: OK Creek Gates-Bending Weir PN#81000713** will be received by the Water Services Department at 4800 East 63rd Street, Kansas City, MO 64130 until 2:00 P.M., February 25, 2025, 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 Director of Water Services, 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. KCMO Preliminary Vendor Security Questionnaire - Form 1 and 2

w. Fully executed Affidavit of Compliance with the Federal Consent Decree regarding the City of Kansas City, Missouri Overflow Control Plan ("OCP") Civil Action No. 4:10-cv-0497-GAF.

x. Other.

4. Waiver of Bid Requirements The Director of Water Services 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 ten (10) 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. Escalation. If during the bid review and approval of the contract, the price of material increases, through no fault of the Contractor, the contract price may be equitably adjusted and subject to escalation. Escalation will be based on cost increases without additional profit, overhead or margin, and shall include material costs only that occur between the bid date and within the 90 day period immediately following the Notice to Proceed date. Such price increases shall be documented through third party sources. See Section 00700, Article 11 and Section 00800 Article 11, Paragraph 11.01.F. for additional information.

12. 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

13. 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.

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 Reporting System for all applicable personnel and shall require subcontractors to submit same.

19. 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.

20. 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 CREO KC 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.

21. 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.

22. 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 00460 CREO KC Timetable for MBE WBE Utilization (CREO KC Form 10); 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.

23. 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.

24. 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.

25. 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 AM to 3:00 PM each day Monday through Friday (holidays excepted). Bidders may contact the following individual from the Water Services Department for an appointment.

Contact: David Elge

Phone: (816) 209-8850 E-mail: David.Elge@kcmo.org

26. 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.

27. Forward all questions in writing to the following Project Manager and Contract Administrator. Questions received less than seven (7) 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.

Kyle Tonjes, P.E., Project Manager
9400 Ward Parkway
Kansas City, MO, 64114
(816) Phone Number

Jamie Driskel, Contract Administration
9400 Ward Parkway
Kansas City, MO, 64114
(816) 652-2927

For persons with disabilities needing reasonable accommodations please contact Jean Lawson at 816-513-6566. If you need to use the Relay Service, please dial 711.

CITY OF FOUNTAINS
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KANSAS CITY
MISSOURI

ADDENDUM NUMBER 2

Project Number 81000713

Project Title Inline Storage: OK Creel Gates-Bending Weir

ISSUE DATE: **2/20/2025**

Bidders are hereby notified that the Bidding and Contract Documents for the above project, for which Bids are to be received on **2/25/25**, are amended as follows:

Specifications

1. Add the following section:
   a. Specification Section 02200 – CLSM Fill for Structures, attached hereto.

2. Delete the following section:
   a. Delete Specification 00210 OCP CD Instructions to Bidders, Section 3. Evidence of Competency to Perform, Subparagraph v.

3. Delete and replace the following section(s);
   a. Delete Specification 00010 Table of Contents and replace with the following Specification 00010 Table of Contents, attached hereto.

   b. Delete Specification Section 15114, Paragraph 2.5 - Materials in its entirety and replace with the following Specification Section 15114, Paragraph 2.5 - Materials:

Frames, Guides, Slides, Reinforcing Members, and Yoke Beams	Stainless steel, ASTM A276, 304L or 316L and ASTM A240, 304L or 316L.
Flush Bottom Closure Seal	Compressible neoprene.
Hollow Bulb J-Seals	Compressible neoprene.
Seal Retainer Bar	Stainless steel, ASTM A276, 304L or 316L and ASTM A240, 304L or 316L.
Slide Seats and Bearing Bars	UHMW polyethylene.
Operating Stems	Stainless steel, AISI Type 304 or 316.
Assembly Fasteners	Stainless steel, AISI Type 302, 303, or 304.

c. Delete Specification Section 15121, Paragraphs 2.2 A, B, and C and replace with the following Specification Section 15121, Paragraphs 2.2 A, B, and C:

A. Gate shall be designed for the conditions and requirements indicated herein.

Gate Number	BW-1
Location	Access Structure
Nominal Gate Size, Width x Height	14'-0" (min) [3]
Tipping Head	5 ft
Operating Tolerance	± 3 in
Top of Weir Elevation	738.00 ft
Notes: 2. Final length and height dependent on Gate Manufacturer Design.	

B. Gate shall be designed such that overflow does not occur before the upstream water level rises to the top of weir elevation plus or minus the operating tolerance, and not be damaged for heads up to 9 feet above the fixed weir elevation.

C. Gate shall be designed to modulate to maintain the upstream water level constant to the operating tolerance listed. If the upstream overflow exceeds the design flow, the bending weir shall accommodate the additional flow by remaining in the fully open position. If the downstream water level rises and submerges the bending weir, the bending weir shall remain in the fully closed position and act as a submerged broad-crested weir.

Drawings:

1. Delete and replace the following:
   a. Delete Sheet No. 23 Rock Box – Sections and replace with Sheet No. 23 Rock Box – Sections Rev 1.
   b. Delete Sheet No. 39 Rock Box Plans and Sections and replace with Sheet No. 39 Rock Box Plans and Sections Rev 1.
   c. Delete Sheet No. 40 Weir Section and replace with Sheet No. 40 Weir Section Rev 1.

NOTE: Bidders must acknowledge receipt of this Addendum by listing the number and date, where provided, on the Bid Form - Document 00410.

SECTION 02200 - CLSM FILL FOR STRUCTURES

PART 1 - GENERAL

1.1 SCOPE

A. This section covers the optional construction method for the fill of the South Rock Box with Controlled Low Strength Material (CLSM).

1.2 GENERAL

A. At the Contractor's discretion and at no additional cost to the Owner, Contractor may elect to use CLSM in place of Expanded Polystyrene Geofoam Infill provided the following requirements are adhered to.

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. CLSM Mix Design

1. Mix design by an independent commercial laboratory retained by the Contractor.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Controlled Low Strength Material (CLSM)

1. CLSM shall consist of a mixture of Portland cement, fly ash, sand, and water and may be placed at locations as indicated on the Drawings. The class of CLSM shall be as specified below.

2. The type of cement in CLSM shall be ASTM C150 Type II. The class of fly ash in CLSM shall be ASTM C618 Class C or ASTM C618 Class F, except loss on ignition shall not exceed 4 percent. Fine aggregate in CLSM shall be clean natural sand, ASTM C33, except that clay particles shall not exceed one percent. Water in CLSM shall be potable.

3. Contractor shall design and test the CLSM. The mix design shall be such as to ensure that the CLSM hardens sufficiently to support the weight of an average person in one to four hours after placement and support equipment weight in 24 hours. The mixture shall be

designed such that when tested in the field with the Kelly Ball apparatus per ASTM D6024, the maximum depression diameter shall be 3 inches. CLSM shall be self-leveling and shall have an average patty diameter from 8 to 12 inches when the flow is measured in accordance with ASTM D6103.

4. The batch proportions accepted by Engineer 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.

5. 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 get the desired results.

6. During the progress of the work, no change shall be made in the batch proportions of the ingredients without the acceptance of Engineer.

7. Class A CLSM

   a. The initial trial mixture for Class A CLSM shall consist of the following minimum proportions per cubic yard to provide minimum compressive strength listed below:

Cement	50 lbs
Fly Ash	250 lbs
Sand (SSD)	2860 lbs
Water	370 lbs
Air Entraining admixture	6 percent
Minimum compressive strength at 28 days	130 psi

2.2 MATERIAL TESTING

A. Review of Materials

1. As stipulated in the Quality Control section, all tests required for preliminary review of materials and materials delivered to the Site shall be made by an acceptable independent testing laboratory at the expense of Contractor. Tests performed by the aggregate supplier are not acceptable. Tests shall have been performed within 2 months of submittal and shall be representative of the material that will be delivered to the Site. Acquisition of samples for testing, both for preliminary review of materials and for testing of materials at the Site, shall be by the Contractor's independent testing laboratory. Samples acquired at the Site shall be obtained after placement and compaction of the material. Aggregate material shall be sampled in accordance with ASTM D75.

2. Two initial gradation tests shall be made for each type of general fill, select fill, structure backfill, granular fill, or other specified material, and one additional gradation test shall be made for each additional 500 tons of each material delivered (imported) to the jobsite or suitable onsite material incorporated in select fill or structure backfill. One additional

gradation test shall be performed for each additional 2,000 tons of general fill material delivered to the jobsite or suitable onsite material incorporated in general fill. In addition, one set of initial Atterberg Limits test shall be made for each fill material containing more than 20 percent by weight pass the No. 200 sieve and for materials specified by Atterberg Limits. One additional Atterberg Limits test shall be made for each additional 500 tons of each material delivered to the job site or otherwise incorporated in select fill or structure backfill. One additional Atterberg Limits test shall be made for each additional 2,000 tons of general fill material delivered to the jobsite or suitable onsite material incorporated in general fill.

3. All material testing on CLSM shall be made by an independent testing laboratory at the expense of Contractor.

B. Field Testing Expense

1. All moisture-density (Proctor) tests and relative density tests on the materials, and all in-place field density tests, shall be made by an independent testing laboratory at the expense of Owner.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 Owner's testing laboratory will use the following general guidelines for frequency of field tests. Additional tests will be performed as necessary for job conditions and number of failed tests.

   a. For area fills and embankments, an in-place field density and moisture test for each 1000 cubic yards of material placed.
   b. One in-place field density and moisture test for every 100 to 200 cubic yards of structure backfill or select fill.
   c. One in-place density and moisture test whenever there is a suspicion of a change in the quality of moisture control or effectiveness of compaction.
   d. At least one test for every full shift of compaction operations on mass earthwork.
   e. Testing of CLSM will be as follows.
      1) Compressive Strength. For every 200 cubic yard of CLSM placed, prepare, cure, remove from molds, and test four 6 by 12 inch test cylinders in accordance with ASTM D4832. Cure cylinders in the molds in accordance with ASTM D4832 until time of testing, at least 14 days. Two cylinders will be tested at 7 days and the other two cylinders will be tested at 28 days.
      2) Flow. Once each day, the CLSM material will be tested for flow in accordance with ASTM D6103.
      3) Unit Weight, Yield, and Air Content. Once each day that flowable fill is placed, unit weight, yield and air content will be determined in accordance with ASTM D6023.
      4) Penetration. Once a day that CLSM is placed, the resistance to penetration from ball-drop apparatus (Kelly Ball) will be measured in accordance with ASTM D6103. (Compliance will be based on maximum depression diameter of 3 inches.)

PART 3 - EXECUTION

3.1 SITE PREPARATION

A. All waste materials shall be removed from the site and disposed of by and at the expense of Contractor. Existing concrete walls shall be pressure washed and free of loose aggregate and debris.

3.2 FILL AND BACKFILL FOR STRUCTURES

A. Controlled Low Strength Material (CLSM) Fill

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 of CLSM the temperature shall be 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. CLSM fill inside the South Rock Box shall be placed in lifts of 2 to 3 feet and the next lift shall not be placed until the previous lift can support the weight of workers without indenting the surface 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.

3.3 SETTLEMENT

A. Contractor shall be responsible for all settlement of backfill, fills, and embankments 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

CITY OF FOUNTAINS
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Project/Contract Number: 81000713 / 1673

Project Title: Inline Storage: OK Creek Gates-Bending Weir

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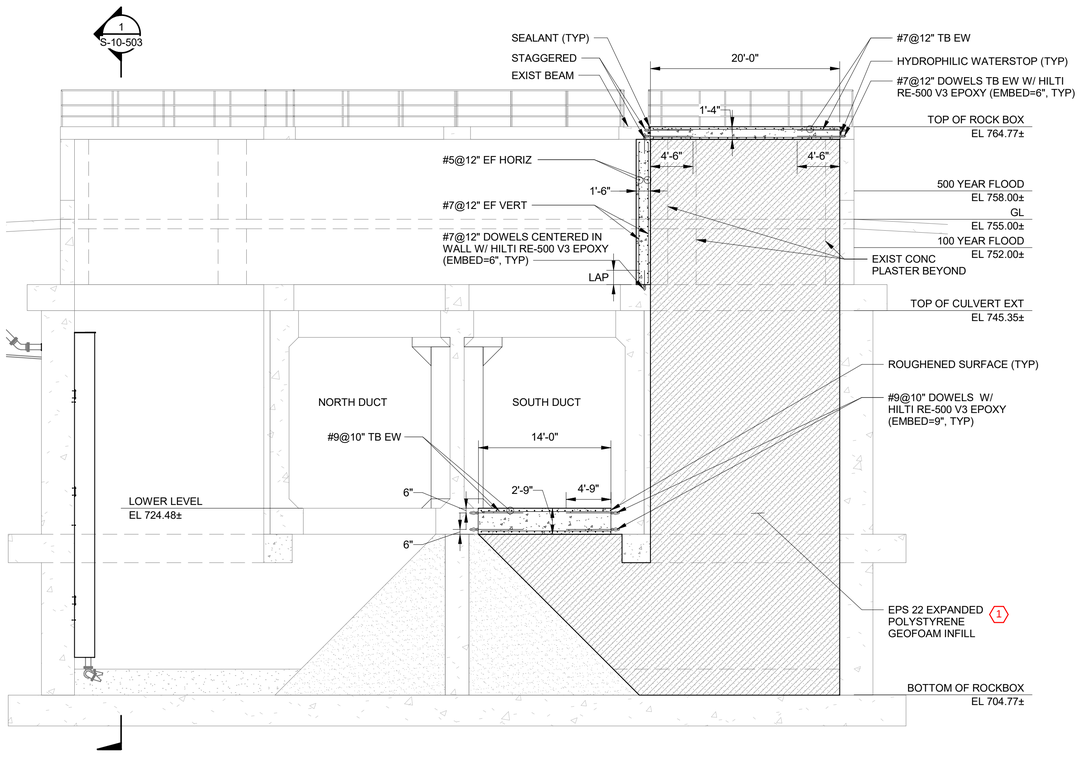
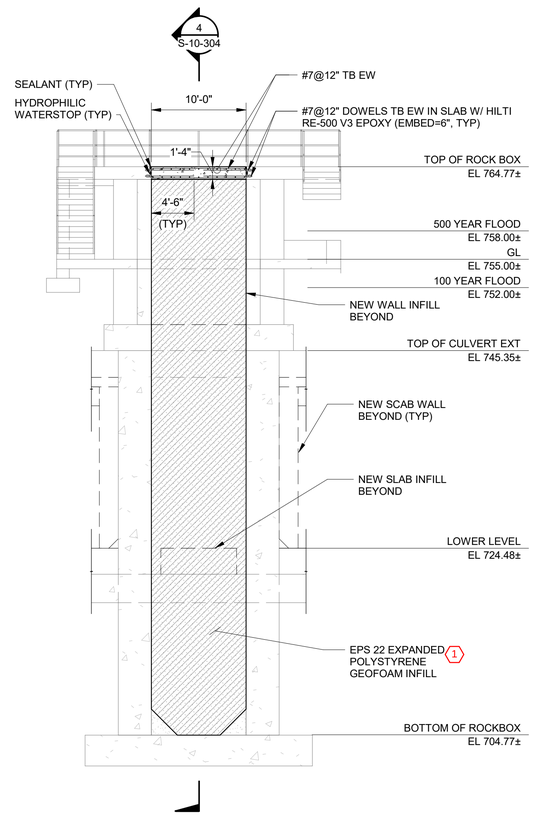
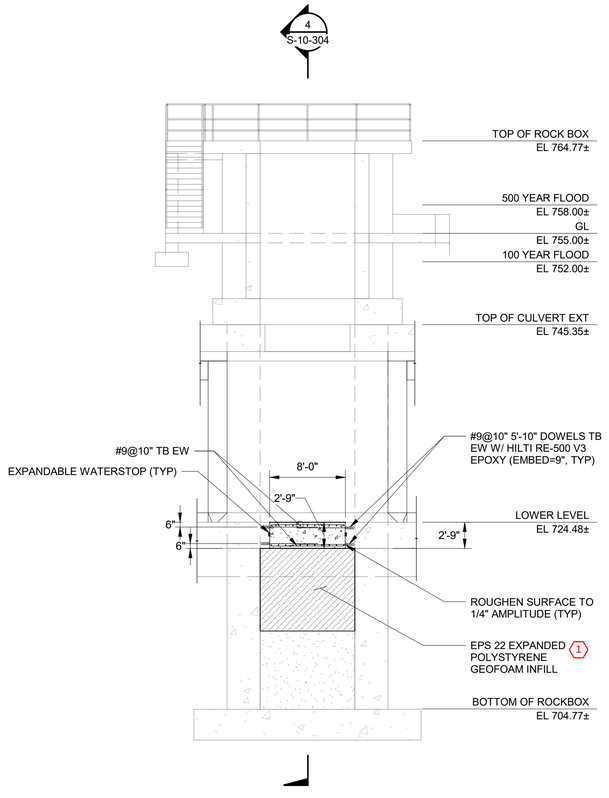


1 ROCK BOX - SECTION 1 OF 3
S-10-402 1/8" = 1'-0"



2 ROCK BOX - SECTION 2 OF 3
S-10-402 1/8" = 1'-0"



3 ROCK BOX - SECTION 3 OF 3
S-10-402 1/8" = 1'-0"

KEY NOTES

1 AT THE CONTRACTOR'S DISCRETION AND AT NO ADDITIONAL COST TO THE OWNER, CONTRACTOR MAY ELECT TO USE CLSM IN PLACE OF EXPANDED POLYSTYRENE GEOFOAM INFILL PROVIDED THE CONTRACTOR ADHERES TO THE REQUIREMENTS OF SECTION 02200, CLSM FILL FOR STRUCTURES.

8' 4' 0' 8' 16'
1/8" = 1'-0"

THE PROFESSIONAL WHOSE SIGNATURE AND PERSONAL SEAL APPEARS HEREON ASSUMES RESPONSIBILITY ONLY FOR WHAT APPEARS ON THIS PAGE, 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 UNDERSIGNED PROFESSIONAL RELATING TO OR INTENDED TO BE USED FOR ANY PART OR PARTS OF THE PROJECT TO WHICH THIS PAGE REFERS.

PROFESSIONAL ENGINEER SEAL

STATE OF MISSOURI
CERVENTE D. SUDDUTH
NUMBER PE-2011015802
PROFESSIONAL ENGINEER
12/2/2024

KANSAS CITY, MISSOURI, WATER SERVICES DEPARTMENT

OK CREEK BENDING WEIR PROJECT

CITY OF KANSAS CITY, JACKSON COUNTY, MISSOURI

TURKEY CREEK PUMP STATION STRUCTURAL ROCK BOX - SECTIONS

0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE

DATE	REVISIONS AND RECORD OF ISSUE	NO.	BY	CK	APP

NAME:
NO.:

FOR WSD USE:

smart sewer

BLACK & VEATCH
8880 Ward Parkway, Suite 400
Kansas City, Missouri 64114 913.458.2000
Professional Engineering Corporation License No. 001646

DuBois Consultants
dubconinc.com
CIVIL + STRUCTURAL ENGINEERING
Kansas City Office
7611 State Line Rd.
Suite 103
Kansas City, MO 64114
(816) 333-7700
Wichita Office
200 W. Douglas Ave.
Suite 325
Wichita, KS 67202
(316) 487-4935
MISSOURI CERTIFICATE OF AUTHORITY #001483

DRAWN BY	CHECKED BY	MAP NO.	RANGE	TWP	SEC
LGC	SJ	53	33W	49N	07

CONTRACTOR | DATE COMPLETED

CONTRACT NO.	DRAWING SUBMITTED	FAC/WME/WO#	DRAWING NO.
1673	DEC 2024		1004.10

PROJECT NO. 81000713 S-10-303 Sheet 23 of 53

BIM 360://412268 – OK Creek Additional Gates – Bending Weir Project/412268-10-PUMP STATION-DuBois.rvt
1:1
12/2/2024 5:55:29 PM

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11/26/2024 10:21:07 AM
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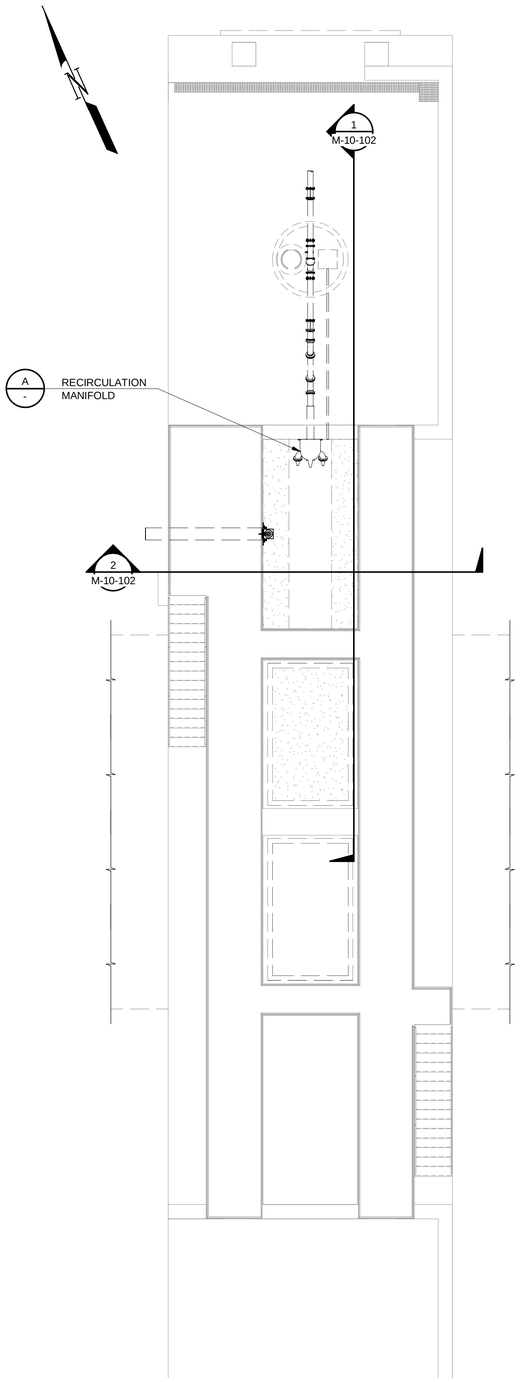
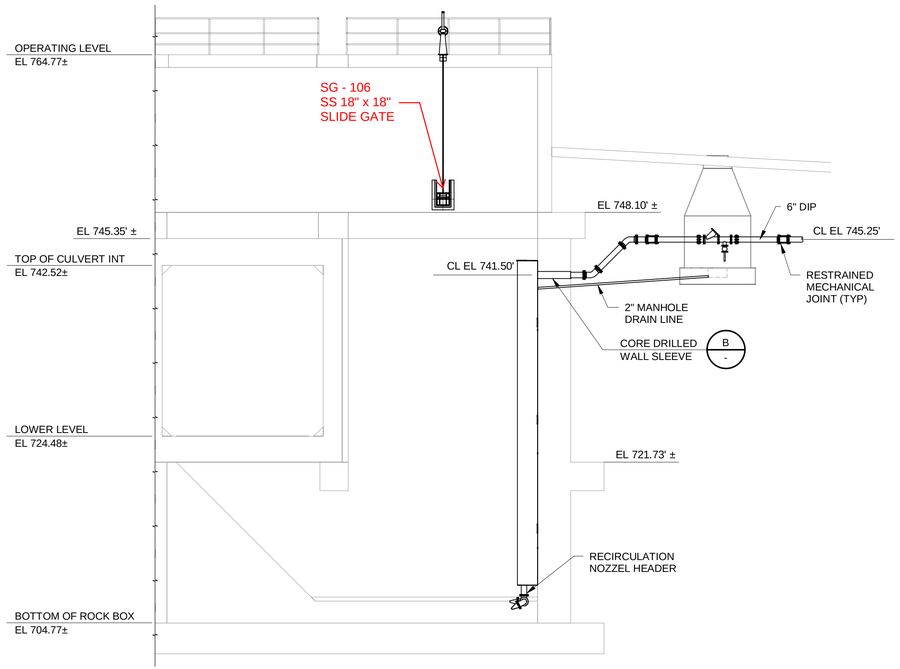
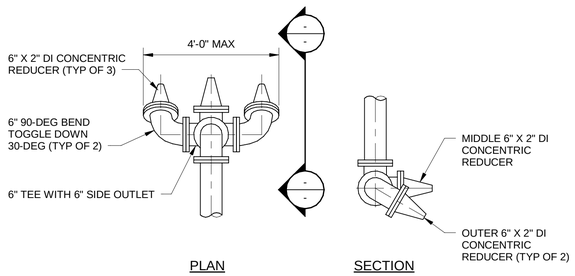


ROCK BOX STRUCTURE AT EL 764.77±

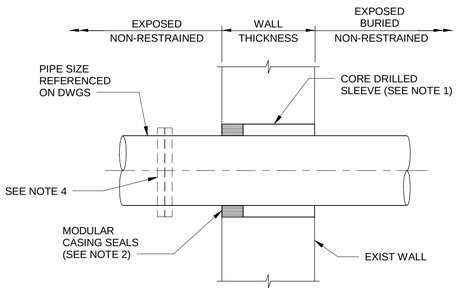
1/8" = 1'-0"



1 SECTION
M-10-102 1/8" = 1'-0"



A RECIRCULATION MANIFOLD
NO SCALE

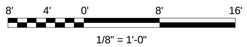


NOTES :

1. CORE DRILL SMOOTH WALL OPENING, COORDINATE CORE DIAMETER AS REQUIRED WITH CASING SEAL MANUFACTURER. MAXIMUM CORE DIAMETER SHALL BE 12".
2. WHEN SOIL MAY BE PRESENT, USE TWO SETS OF CASING SEALS. ONE AT EACH FACE OF WALL.
3. TO MINIMIZE SLEEVE SIZE, PROVIDE A SCREW-ON FLANGE, GROOVED COUPLING, OR MECHANICAL COUPLING WITH ANCHOR STUDS ON ONE SIDE OF OPENING.
4. FOR BURIED PIPING, CONTRACTOR SHALL PROVIDE AN ADDITIONAL FIELD JOINT AS CLOSE AS PRACTICAL TO FACE OF WALL, BUT NO MORE THAN 5 FEET.
5. USE WAX TAPE TO PROTECT ALL BURIED FERROUS SURFACES INCLUDING PAINTED SURFACES. FOR PROTECTION OF ADJACENT PIPE BARREL SURFACES, SHRINK WRAP MAY BE USED IN LIEU OF WAX TAPE. SEE SPECIFICATIONS.

B CORE DRILLED WALL SLEEVE
NO SCALE

2 SECTION
M-10-102 1/8" = 1'-0"



1/8" = 1'-0"

IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE

DATE	REVISIONS AND RECORD OF ISSUE	NO.	BY	CK	APP

BLACK & VEATCH
8880 Ward Parkway, Suite 400
Kansas City, Missouri 64114 913.458.2000
Professional Engineering Corporation License No. 001646

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PROFESSIONAL ENGINEER SEAL

NAME: Chris L. Ramsey
NO.: PE - 2018041334

FOR WSD USE:

smart sewer

KANSAS CITY, MISSOURI, WATER SERVICES DEPARTMENT

OK CREEK BENDING WEIR PROJECT

CITY OF KANSAS CITY, JACKSON COUNTY, MISSOURI

TURKEY CREEK PUMP STATION PROCESS MECHANICAL ROCK BOX - PLANS AND SECTIONS

DRAWN BY	CHECKED BY	MAP NO.	RANGE	TWP	SEC
NVN		53	33W	49N	07

CONTRACTOR	DATE COMPLETED

CONTRACT NO.	DRAWING SUBMITTED	FAC/WME/WO#	DRAWING NO.
1673			1004.10

PROJECT NO. 81000713 M-10-102 Sheet 39 of 53

BIM 360://412268 - OK Creek Additional Gates - Bending Weir Project/412268-10-PUMP STATION-B&V.rvt
11/26/2024 10:21:04 AM
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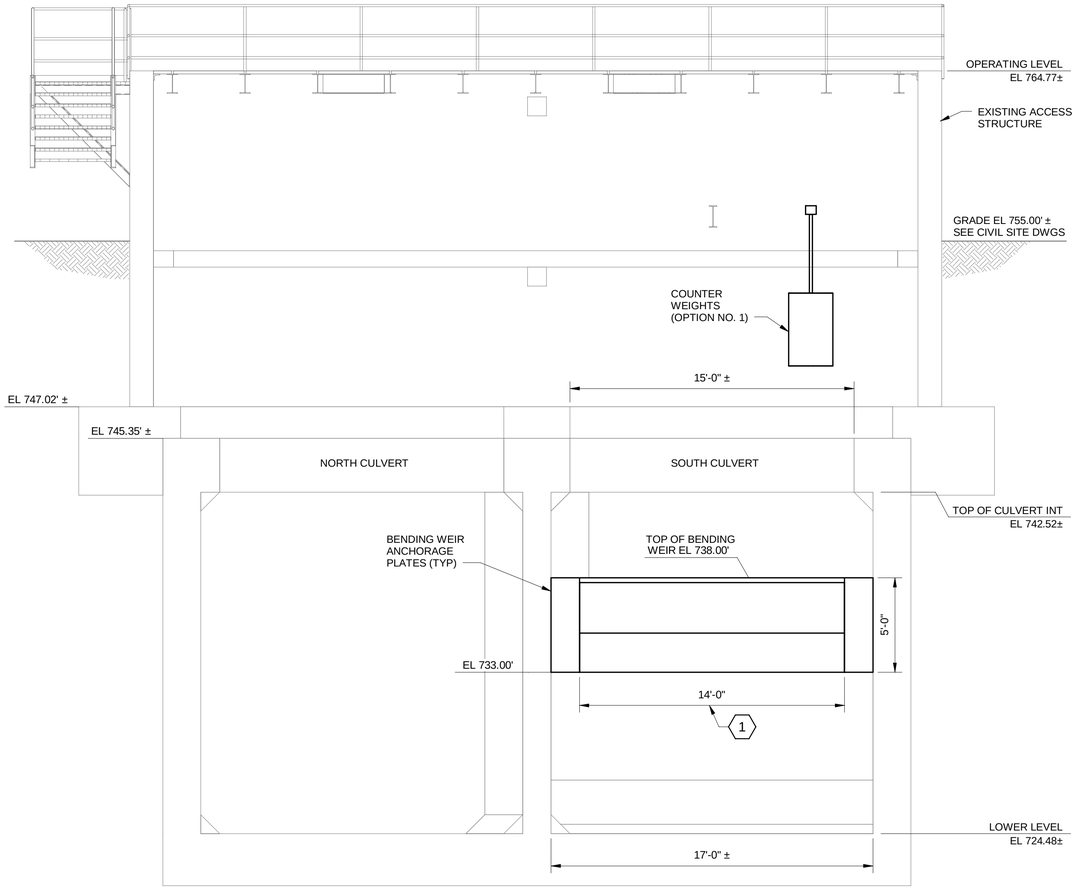
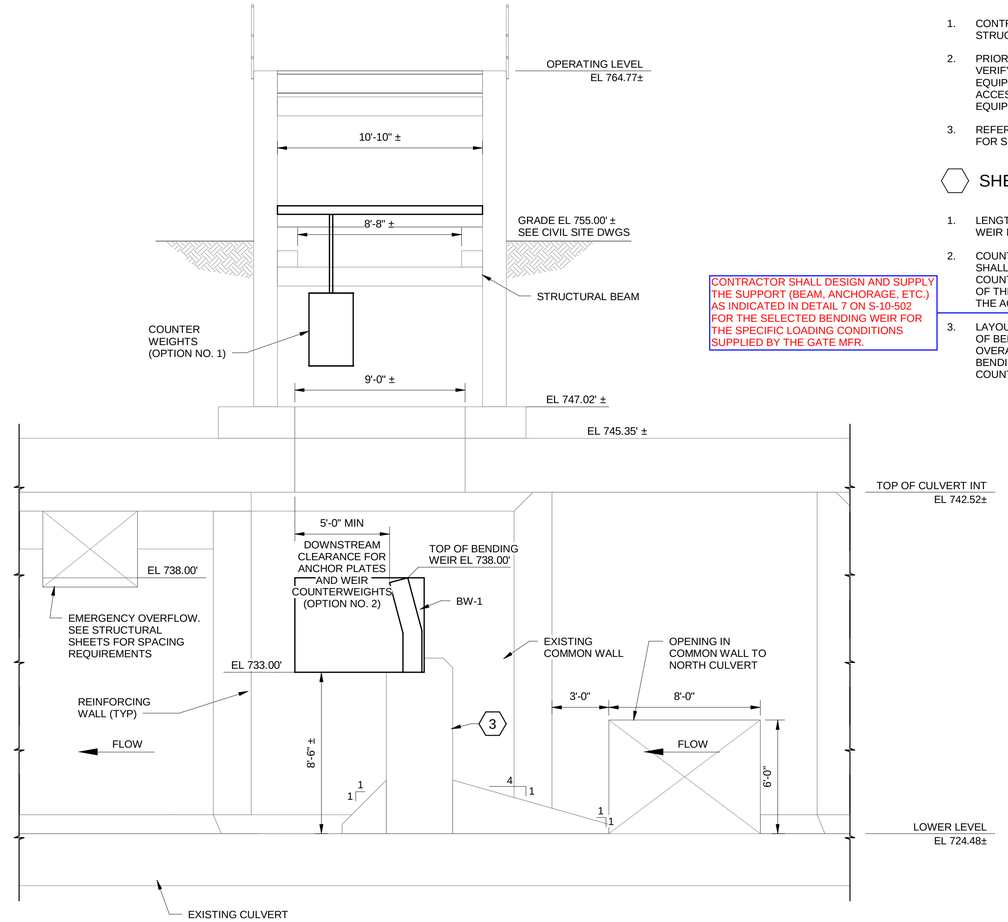


1 SECTION
M-10-101 1/4" = 1'-0"



2 SECTION
M-10-101 1/4" = 1'-0"

GENERAL NOTES

1. CONTRACTOR TO PROTECT EXISTING ACCESS STRUCTURE.
2. PRIOR TO CONSTRUCTION THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND ELEVATIONS WITH EQUIPMENT MANUFACTURER, PROVIDE NECESSARY ACCESSORIES FOR INSTALLATION AND TO FACILITATE EQUIPMENT REMOVAL.
3. REFER TO STRUCTURAL DRAWINGS FOR REQUIREMENTS FOR SEQUENCE OF CONSTRUCTION.

SHEET KEYNOTES

1. LENGTH OF BENDING WEIR DEPENDENT ON BENDING WEIR MFR MOUNTING/ANCHORAGE REQUIREMENTS.
2. COUNTERWEIGHT(S) AND ACCESSORIES AND SUPPORT (BEAM) SHALL BE PROVIDED BY THE BENDING WEIR GATE MFR. COUNTERWEIGHT SHALL BE INSTALLED DOWNSTREAM OF THE BENDING WEIR OR ABOVE THE BENDING WEIR, IN THE ACCESS STRUCTURE.
3. LAYOUT OF SUPPORTING WALL IS DEPENDENT ON MFR OF BENDING WEIR. CONTRACTOR SHALL SUBMIT OVERALL LAYOUT INCLUDING PLACEMENT OF THE BENDING WEIR TO THE ACCESS STRUCTURE, COUNTERWEIGHTS, INFILLS, ETC. FOR REIVEW.

CONTRACTOR SHALL DESIGN AND SUPPLY THE SUPPORT (BEAM, ANCHORAGE, ETC.) AS INDICATED IN DETAIL 7 ON S-10-502 FOR THE SELECTED BENDING WEIR FOR THE SPECIFIC LOADING CONDITIONS SUPPLIED BY THE GATE MFR.

4' 2' 0' 4' 8'
1/4" = 1'-0"

0 1/2 1
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE

DATE	REVISIONS AND RECORD OF ISSUE	NO.	BY	CK	APP

BLACK & VEATCH
8880 Ward Parkway, Suite 400
Kansas City, Missouri 64114 913.458.2000
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PROFESSIONAL ENGINEER SEAL

NAME: Chris L. Ramsey
NO.: PE - 2018041334

FOR WSD USE:

smart sewer

KANSAS CITY, MISSOURI, WATER SERVICES DEPARTMENT

OK CREEK
BENDING WEIR PROJECT

CITY OF KANSAS CITY, JACKSON COUNTY, MISSOURI

TURKEY CREEK PUMP STATION
PROCESS MECHANICAL
WEIR SECTIONS

DRAWN BY	CHECKED BY	MAP NO.	RANGE	TWP	SEC
BWA	KDA	53	33W	49N	07

CONTRACTOR | DATE COMPLETED

CONTRACT NO.	DRAWING SUBMITTED	FAC/WME/WO#	DRAWING NO.
1673			1004.10

PROJECT NO. 81000713

M-10-301 Sheet 40 of 53

CITY OF FOUNTAINS
HEART OF THE NATION

KANSAS CITY
MISSOURI

REQUEST FOR INTERPRETATION

Project Number _____

Project Title _____

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 Number _____

Project Title _____

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 Number: _____

Project Title: _____

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 Number _____

Project Title _____

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 Number _____

Project Title _____

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 Contractors 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 "Deputy 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 Achievement of Full Operation 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.

I certify under penalty of law that the document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted, and that the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

[**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:**	Andy Shively, P.E. Deputy Director	**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

OCP CONSENT DECREE
WORK CHANGE DIRECTIVE

Project/ Contract Number _____

Project Title _____

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:

- ❑ Unit Prices
- ❑ Lump Sum
- ❑ As Stipulated in General Conditions
- ❑ Other _____

Maximum Not to Exceed Amount (increase or decrease):

$ _____

If the change involves an increase, the estimated Amount is not to be exceeded without further authorization.

Method of determining change in Contract Times:

- ❑ CONTRACTOR's Records
- ❑ DESIGN PROFESSIONAL's Records
- ❑ City's Records
- ❑ Other _____

Not to Exceed Contract Times (increase or decrease):

Achievement of Full Operation: _____ days;

Final Completion: _____ days.

If the change involves an increase, the Not to Exceed Contract Times are not to be exceeded without further authorization.

I certify under penalty of law that the document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted, and that the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Recommended:	Recommended:	Recommended:
DESIGN PROFESSIONAL	CONTRACTOR	CITY
By (Authorized Signature)	By (Authorized Signature)	By (Authorized Signature)

_____ Project Manager Initials

_____ Smart Sewer Program Construction Manager Initials

Distribution:

- ❑ City
- ❑ Contractor
- ❑ Construction Manager
- ❑ Design Professional
- ❑ Consultant
- ❑ Other

SECTION 01000 – GENERAL PROJECT REQUIREMENTS

PART 1 - GENERAL

1.01 SUMMARY

A. This section covers the general project requirements for all projects.

1.02 RELATED SECTIONS

A. Section 00700 – General Conditions.
B. Section 00800 – Supplementary Conditions.
C. Section 01015 – Specific Project Requirements.
D. Section 01020 – Record Documents.
E. Section 01300 – Submittals.
F. Section 01566 – Cleanup Operations.
G. Section 01570 – Temporary Erosion Control.
H. Section 01580 – Project Signs.
I. Section 01581 – Public Communications.
J. Section 02180 – Clearing and Grubbing.
K. Section 02190 – Demolition and Disposal of Debris.
L. Section 02200 – Earthwork.
M. Section 02949 – Tree Protection, Removal and Replacement.

1.03 CODES AND STANDARDS

A. By reference, as applicable for the Work being performed.

1.04 SUBMITTALS

A. Submit as specified in Section 01300 – Submittals.
B. Project Communications:
    1. Progress Meeting Minutes.
C. Other:
    1. Description and location of offsite storage arrangements.
    2. Construction Site Plan.
    3. Safety Representative.

1.05 QUALITY ASSURANCE

A. The Contractor is responsible for the quality assurance and quality control of the Work.

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Storage of materials and equipment shall conform to manufacturer's recommendations.
B. Storage of equipment and material shall not interfere with public access and/or safety.
C. All material shall be protected from weather. Gaskets shall be protected from exposure to sunlight.
D. Offsite Storage:
    1. Offsite storage arrangements shall be approved by the City for all materials and equipment.

2. It is the Contractor's sole responsibility to provide adequate and satisfactory security and protection.
3. Offsite storage facilities shall be bonded and accessible to City.

E. Preparation for Shipment:
1. All materials and equipment incorporated into the project shall be suitably packaged to facilitate handling and protect against damage during transit and storage.
2. Painted surfaces shall be protected against impact, abrasion, discoloration, and other damage. All painted surfaces, which are damaged prior to acceptance of materials and equipment, shall be repainted to the satisfaction of the City.
3. Pipe and fitting linings shall be protected against damage.
4. Each item, package, bundle of material, or piece 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.

1.07 MATERIALS SELECTION AND ACQUISITION

A. The Contractor shall not use materials or equipment removed from existing premises, except as specifically permitted by the Contract Documents. All products shall be new, never used before, unless otherwise specified.
B. Provide interchangeable components of the same manufacturer, for similar removable components, such as: T-bolts, glands, gaskets, manhole rings and covers, etc.

1.08 CONSTRUCTION SITE PLAN

A. Unless otherwise specified in Section 01015 – Specific Project Requirements, prior to the start of work, the Contractor shall submit a site plan showing the locations and dimensions of temporary facilities which include, but are not limited to, the following layouts and details:
1. Equipment and material storage area (on-site and off-site).
2. Access and haul routes.
3. Avenues of ingress/egress in fenced areas.
4. Details of the fence installation.
5. Any areas which may have to be protected to prevent the tracking of mud.
6. Indicate if a supplemental or other staging area is being utilized.
7. Show locations of safety and construction fencing, job site trailer, construction entrances, trash dumpsters, temporary sanitary facilities and parking areas for project personnel.
8. Indicate locations of concrete washout facilities.

1.09 EASEMENTS AND RIGHTS-OF-WAY

A. The City will furnish the Site in accordance with Section 00700 - General Conditions. The Contractor shall confine construction operations to the immediate vicinity of the Site shown in the Contract Documents and shall use due care in placing construction tools, equipment, excavated materials, construction materials and supplies to cause the least possible damage to property and least possible interference with public traffic.

B. On Private Property:
   1. The permanent easements are as noted in the Contract Documents. No additional temporary construction easements have been obtained, unless otherwise indicated in the Contract Documents. The Contractor shall set stakes to mark the boundaries of construction easements across each private property. The stakes shall be protected and maintained until completion of the Work. After cleanup has been completed in accordance with Section 01566 – Cleanup Operations, the Contractor shall remove all construction stakes.
   2. The Contractor shall not enter any private property outside the designated construction easement boundaries without written permission from the owner of the property.
   3. Should it become necessary to use or occupy the land beyond the limits of the Site (as defined by Section 00700 – General Conditions), the Contractor shall obtain a written agreement with each affected property owner and tenant. Each agreement shall clearly outline the terms for which the Contractor may utilize the property and shall be fully executed by the Contractor, the property owner and the tenant (when applicable).
   4. Whenever the easement is occupied by crops which will be damaged by construction operations, the Contractor shall notify the property owner sufficiently in advance so that the crops may be removed before the Work is started. The Contractor is responsible for all damage to crops outside the easement and shall make satisfactory settlement for the damage directly with the property owner.
   5. Where the Work impacts fields that are leveled for irrigation or terraced, the Contractor shall relevel irrigated fields and replace all terraces to their original or better condition and to the satisfaction of the property owner.

C. Crossing State Highways:
   1. The City has obtained permission from the Missouri Department of Transportation (MoDOT) for the construction of the Work. The Contractor shall secure all necessary MoDOT permits and post bond as required for construction within the limits of the MoDOT right-of-way. All work within MoDOT right-of-way shall be in conformance with MoDOT regulations. The permit must be secured before any construction is started within MoDOT right-of-way.

1.10 MAIL BOXES

A. The U.S. Post Office Department's regulations prohibit the delivery of mail to addresses where there are no mailboxes or where the mailboxes are not readily accessible because of construction excavation.

B. The Contractor's execution of the Work shall not impede delivery of the mail. The Contractor shall ensure that all mail delivery to all mail boxes is uninterrupted. All excavated material, equipment, supplies shall be kept clear of mail boxes to allow normal access for mail delivery personnel and vehicles.

C. When removal of a mail box is necessary to facilitate the Work, it shall be removed, stored and re-set to its original position and elevation. From the time a mail box is removed, it shall be re-set and the surrounding area stabilized and restored within 24 hours.

1.11 LINES AND GRADES

A. All Work shall be done to the lines, grades and elevations indicated in the Contract Documents.
B. Basic horizontal and vertical control points are provided in the Contract Documents. All additional survey, layout and measurement work shall be performed by the Contractor as a part of the Work.
C. The Contractor shall provide an experienced instrument person, competent assistants and all instruments, tools, stakes and other materials required to complete the survey, layout and measurement work.
D. The Contractor shall provide qualified personnel, materials and equipment (tools, stakes and other materials) as may be required for the following tasks needed in the Work:
    1. Establish or designate control points.
    2. Establish construction easement boundaries.
    3. Verify survey.
    4. Verify layout shown on the Contract Documents.
    5. Verify and document work performed by the Contractor.

    These efforts shall be included in the Contractor's bid price and performed at no additional cost to the City.
E. The Contractor shall remove and reconstruct, at no additional cost to the City, any Work that was improperly installed or improperly located.
F. See Section 01020 – Record Documents, paragraph SURVEY REQUIREMENTS for additional requirements.

1.12 CONNECTIONS TO EXISTING FACILITIES

A. Unless otherwise specified or indicated, the Contractor shall make all necessary connections to existing facilities. This includes, but is not limited to, structures, drain lines, water utilities, sewer utilities, gas utilities, communications utilities and electric utilities. In each case, the Contractor shall receive permission from the City or the owning utility prior to undertaking a connection. The Contractor shall protect facilities against deleterious substances and damage.
B. Connections to existing facilities that are in service shall be thoroughly planned in advance. All required equipment, material and labor shall be on hand at the time of undertaking the connections. Work shall proceed continuously (around the clock) to complete connections in the minimum time possible. Operation of valves or other appurtenances on existing utilities, when required, shall be by or under the direct supervision of the owning utility.

1.13 UNFAVORABLE CONSTRUCTION CONDITIONS.

A. During unfavorable weather, wet ground, or other unsuitable construction conditions, the Contractor shall confine operations to Work that will not be adversely affected by such conditions.
B. No portion of the Work shall be constructed under conditions that would adversely affect the quality or efficiency thereof, unless special means or precautions are taken by the Contractor to perform the Work in a manner acceptable to the City.

1.14 UNDERGROUND FACILITIES AND ASSOCIATED RESTORATION

A. As provided in Section 00700, paragraph 4.04 of the General Conditions, the Contractor shall perform all cutting and patching required for the Work and as may be necessary in connection with locating all underground facilities, installation of Work, uncovering Work for inspection or for the correction of defective Work.
B. The 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.
C. The Contractor shall provide all shoring, bracing, supports and protective devices necessary to safeguard all Work and existing facilities during cutting and patching operations. The Contractor shall not undertake any cutting or demolition that may affect the structural stability of the Work or existing facilities without City's approval.
D. Materials shall be cut and removed as required to complete the Work. Materials shall be removed in a careful manner, with no damage to adjacent facilities or materials. The Contractor shall remove all excavated materials from the site that cannot be incorporated in the Work.
E. All Work and existing facilities affected by cutting operations shall be restored with new materials, or with salvaged materials acceptable to City, to obtain a finished installation with strength, appearance and functional capacity required to match the existing area. If necessary, entire surfaces shall be patched and refinished.
F. The Contractor, at no extra cost to the City, shall replace all surface features damaged, removed or so designated to be replaced.

1.15 ENVIRONMENTAL PROTECTION

A. Laws and Regulations:
    1. The Contractor shall conform to all laws and regulations as required by Section 00700 – General Conditions, Article 6 – Contractor's Responsibilities.
B. Storm Water Runoff:
    1. Storm Water Pollution Prevention Plan (SWPPP): As required by Section 00700 – General Conditions, Article 6 – Contractor's Responsibilities.
    2. Erosion Sediment Control: See Paragraph 1.25.
    3. The Contractor shall prevent the pollution of drains and watercourses by sanitary wastes, sediment, debris and other substances resulting from construction activities. See paragraph 1.38.
    4. Dewatering: As required by Section 02200 – Earthwork.
    5. Concrete Washout Facilities: As required by Section 01566 – Cleanup Operations.
C. Air Pollution:
    1. Burning: No open burning will be permitted.
    2. Dust Control: See paragraph 1.37.
D. Other Construction Activities:
    1. Disposal of Demolition Material: As required by Section 02190 – Demolition.
    2. Disposal of Debris: Section 02180 – Clearing and Grubbing and Section 02200 – Earthwork.

3. Protection of Wetlands: As shown on the Drawings or as specified in Section 01015 – Specific Project Requirements.
4. Floodplains: As shown on the Drawings or as specified in Section 01015 – Specific Project Requirements.
5. Cleanup and Site Maintenance: As required by Section 01566 – Cleanup and Site Maintenance.

1.16 LICENSES, PERMITS, AND CERTIFICATES

A. Requirements for licenses, permits and certificates are provided in Section 00700 – General Conditions, paragraph 6.09.
B. Permitting exceptions (if any) are noted in Section 00800 – Supplementary Conditions.

1.17 APPLICABLE CODES

A. Standard specifications of the Kansas City, Missouri Department of Public Works are, by reference, hereby made a part of this contract specifications. See Section 01015 – Specific Project Requirements for additional information.

1.18 REFERENCE STANDARDS

A. See Section 00700 – General Conditions, paragraph 3.02 for references to standards and specifications of technical societies.

1.19 PRECONSTRUCTION CONFERENCE

A. A Preconstruction Conference will be held in accordance with Article 2 of the General Conditions. The conference will be held at a mutually agreed time and location. The conference shall be attended by:
   1. Contractor and the project superintendent.
   2. Design Professional.
   3. Resident Project Representative.
   4. Representatives of City.
B. Other participants as requested by the Contractor, City, or Design Professional; such as the following:
   1. Principal Subcontractors.
   2. Representative of principal suppliers and manufacturers as appropriate.
   3. Utility Company representatives.
   4. Governmental representatives as appropriate.
   5. The Contractor shall bring to the conference the Preliminary Schedules described in Article 2 of the General Conditions (Preliminary Project Schedule, Preliminary Schedule of Values, Preliminary Schedule of Shop Drawings and Samples) and other pertinent information.
C. The purpose of the conference is to designate responsible personnel and to establish a working relationship. Matters requiring coordination will be discussed and procedures for handling such matters established. The agenda shall include, but not limited to, the following:
   1. Contractor's Preliminary Schedules.
   2. Document Management.
   3. Processing Applications for Payment.
   4. Maintaining record documents and electronic data requirements.
   5. Critical Work sequencing.
   6. Field decisions and Change Orders.

7. Use of premises, field office, material storage areas, security, housekeeping, and City's needs.
8. Major equipment deliveries and priorities.
9. Contractor's assignment for Safety Representative.
10. Expectations and the Contractor's plan for Environmental Protection.

D. City or Design Professional will preside at the conference, will arrange for keeping the minutes and will distribute the minutes to all persons in attendance.

1.20 PROGRESS MEETINGS

A. The Contractor shall schedule and hold progress meetings at least monthly, at other times as requested by the City or as needed by the progress of the Work. The Contractor, City, Design Professional, and all Subcontractors active on the Site shall be represented at each meeting. The Contractor may, at their discretion, request attendance of their suppliers, manufacturers or other utilities.

B. The Contractor shall preside at the meeting. Meeting minutes shall be prepared and distributed by the Contractor after review by the City or Design Professional. The purpose of the meetings will be to review the progress of the Work, maintain coordination of efforts, discuss changes in scheduling and resolve problems which may have developed on the project.

1.21 SAFETY REPRESENTIVE

A. In accordance with Section 00700 – General Conditions, Article 6 – Contractor's Responsibilities, the Contractor shall submit the name and complete contact information for the person designated as the Safety Representative for the Project.

B. In accordance with Section 01300 – Submittals, This information shall be submitted prior to the Preconstruction Conference.

C. If the Safety Representative changes during the Project, the Contractor shall designate a new person to fulfill the role and submit their name and complete contact information.

1.22 SITE ADMINISTRATION

A. The Contractor is responsible for all areas of the site used by their personnel and all Subcontractors in the performance of the Work. The Contractor will 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. The Contractor has 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 to observe the same regulations as their personnel.

1.23 CLEAN-UP

A. The Contractor shall conduct cleanup operations in accordance with Section 01566 – Project Cleanup.

1.24 FINAL ACCEPTANCE

A. Final Acceptance of the Work shall be in accordance with Section 00700 – General Conditions, Article 14.

1.25 EROSION AND SEDIMENT CONTROL

A. Work associated with erosion and sedimentation control shall be done in accordance with Section 01570 – Temporary Erosion and Sediment Control.

1.26 STREET LIGHTS

A. Relocation or restoration of streetlights due to construction interference shall be included in the Contractor's Bid Price. No separate measurement and payment will be made. The Contractor shall notify and coordinate street light relocations with the Public Works Department:

Street Lights Division
Phone: (816) 513-9500.

1.27 PROJECT SIGNS

A. Work associated with Project signs shall be done in accordance with Section 01580 – Project Signs.

1.28 RESTORATION

A. The Contractor shall replace all surface material and shall restore all paving, curbs, gutters, sidewalks, driveways, shrubbery, fences, sod and all other features disturbed to a condition of equal to or better than before the work began, furnishing all material, labor and equipment incidental thereto.

1.29 WATER

A. The City will furnish, without charge, all water necessary for the Work (i.e., filling, flushing, testing and disinfecting completed water lines). The Contractor shall make arrangements with the City for all water used.
B. Use of the City's water facilities shall be at the direction of the Water Services Department so that water is not wasted and service to customers is not impaired.
C. Any water furnished by the City must be obtained from an existing City main.
D. The Contractor shall use a Reduced Pressure Zone (R.P.Z.) Backflow Preventer and meter when connected to the City's water system. The Contractor shall contact the Kansas City Fire Department (KCFD) at (816) 513-4645 to purchase a hydrant meter permit. After securing a hydrant meter permit from KCFD, the Contractor shall present the permit to the Consumer Services desk located at Water Services Department headquarters, 4800 E. 63rd Street, KCMO. The Contractor shall apply for and pay Consumer Services the refundable security deposit. If approved, the Contractor shall contact the Water Services Backflow Department at (816) 513-4797 to schedule the installation of the R.P.Z./Meter (hydrant meter). The Contractor shall provide the location of the hydrant where the R.P.Z./Meter is to be installed. The Contractor shall contact the Backflow Department to have the R.P.Z./Meter moved or returned to Water Services. Jetting and Vacuum trucks with approved backflow prevention devices or air gap separation are not required to utilize a R.P.Z. backflow preventer; however, a meter to track water usage shall be used at all the times. The Jetter/Vac Contractor shall contact the Water Services Backflow Department for issuance of the meter and pay the associated refundable security deposit. In all cases, the Contractor is solely responsible for any and all damage to the equipment issued by the Water Services Backflow Department. The cost to repair the damage or the cost of complete replacement of the unit shall be deducted from the security deposit.

E. All costs for labor, material, equipment and services needed to obtain water for construction purposes shall be included in the Bid. No separate measurement or payment will be made to make connections.

1.30 OPERATION OF EXISTING VALVES

A. The Contractor shall not operate any valves on the City's system without direct supervision from a Water Services Department representative.
B. If the Contractor needs valves operated, the request shall be made at least forty-eight (48) hours in advance to Water Services for such operation, also giving notice to any affected customers/properties in accordance with the notification requirements outlined in Section 01581 – Public Communications.
C. The hydrant branch valves may be operated in the presence of a Water Services Department representative with no official advance notification.
D. All fire hydrants and water valves shall be kept free from obstruction and available for use at all times.

1.31 BARRICADES AND LIGHTS

A. All streets, roads, highways and other public thoroughfares which are closed to traffic shall be protected by effective barricades and acceptable warning signs. Barricades shall be located per the approved traffic control plan and associated permit.
B. All trenches and other excavations shall be covered and 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 execution 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 as required by the authority having jurisdiction; such as, Work within railroad right-of-way, highway right-of-way, etc.

1.32 EXISTING FENCING

A. All existing fences affected by the Work shall be maintained by the 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.
B. 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.
C. On completion of the Work across any tract of land, the Contractor shall restore all fences to their original location and to their original or better condition.

1.33 SAFETY FENCING

A. Provide fencing along the construction site at all open excavations and tunnels to control access by unauthorized people.

B. The safety fencing must be a high visibility orange colored, high density polyethylene grid or approved equal, a minimum of 48 inches high and maximum mesh size of 2 inches, supported and tightly secured to steel posts located on maximum 10-foot centers, constructed at the approved location.
C. Remove the fence from the work site upon completion of the Work.

1.34 PROTECTION OF PUBLIC AND PRIVATE PROPERTY

A. The Contractor shall protect, shore, brace, support, and maintain all underground pipes, conduits, drains and other underground construction uncovered or otherwise affected by the construction operations.
B. All pavement, surfacing, driveways, curbs, gutters, sidewalks, buildings, utility poles, guy wires, fences, and all other features and structures affected by construction operations, together with all sod and shrubs in yards, parkways, medians and green spaces, shall be restored to their original condition, whether within or outside the right-of-way or easement. All replacements shall be made with new materials.
C. Work associated with tree protection, removal and replacement shall be done in accordance with Section 02949 – Tree Protection, Removal and Replacement.

1.35 DAMAGE TO EXISTING PROPERTY

A. The Contractor is solely responsible for any damage to existing features, structures, Work, materials, or equipment because of their operations and shall repair or replace any damaged features, structures, Work, materials, or equipment to the satisfaction of the City and at no additional cost to the City.
B. The Contractor shall protect all existing structures and property from damage and shall provide bracing, shoring, or other work necessary for such protection.
C. The Contractor is 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 personnel to or from the Work. The Contractor shall make satisfactory and acceptable arrangements with the agency having jurisdiction over the damaged property concerning its repair or replacement.

1.36 NOISE CONTROL

A. The Contractor shall conduct construction operations as described herein and in compliance with the City of Kansas City, Missouri Code of Ordinances, Chapter 46 – NOISE CONTROL.
B. The Contractor shall take all 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 the efficient performance of the Work.
C. During construction activities on or adjacent to occupied buildings and when appropriate, the Contractor shall erect screens or barriers effective in reducing noise in the building and shall conduct their operations to avoid unnecessary noise which might interfere with the activities of the building occupants.

D. All work including, but not limited to, excavation, demolition, alteration, or repair being performed in or adjacent to a residential area other than between the hours of 7:00 a.m. and 6:00 p.m. on weekdays, except in the case of urgent necessity in the interest of public safety, shall require a letter of permission from the Water Services Department of the City of Kansas City, Missouri.

1.37 DUST CONTROL

A. The Contractor shall control dust in accordance with Section 01566 – Cleanup Operations, paragraph DUST CONTROL. The Contractor shall take all reasonable measures to prevent unnecessary dust. Earth surfaces subject to dusting shall be kept moist with water or by the approved application of an approved chemical suppressant. When practicable, dusty materials in piles or in transit shall be covered to prevent blowing.

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.

1.38 POLLUTION CONTROL

A. The Contractor shall prevent the pollution of drains and watercourses by sanitary wastes, sediment, debris or other substances resulting from the construction activities. No sanitary wastes will be permitted to enter any drain or watercourse other than sanitary sewers. No sediment, debris, or other substance will be permitted to enter sanitary sewers and all reasonable measures will be taken to prevent such materials from entering any drain or watercourse.

1.39 SECURITY

A. The Contractor is solely responsible for security and protection of the site. This includes protecting all Work, materials, equipment, existing facilities and all temporary facilities against theft, vandals and access by unauthorized persons.

B. No claim shall be made against the City by reason of an act of an employee or trespasser. The Contractor shall make good on all damage and theft of property resulting from the Contractor's failure to provide adequate security measures.

1.40 PARKING

A. The Contractor shall provide and maintain suitable parking areas for the use of all City personnel, construction workers and others performing work or furnishing services in connection with the Project. Suitable parking is required to avoid the need for parking personal vehicles where they may interfere with traffic, City's operations, or construction activities.

1.41 PIPELINE MARKERS

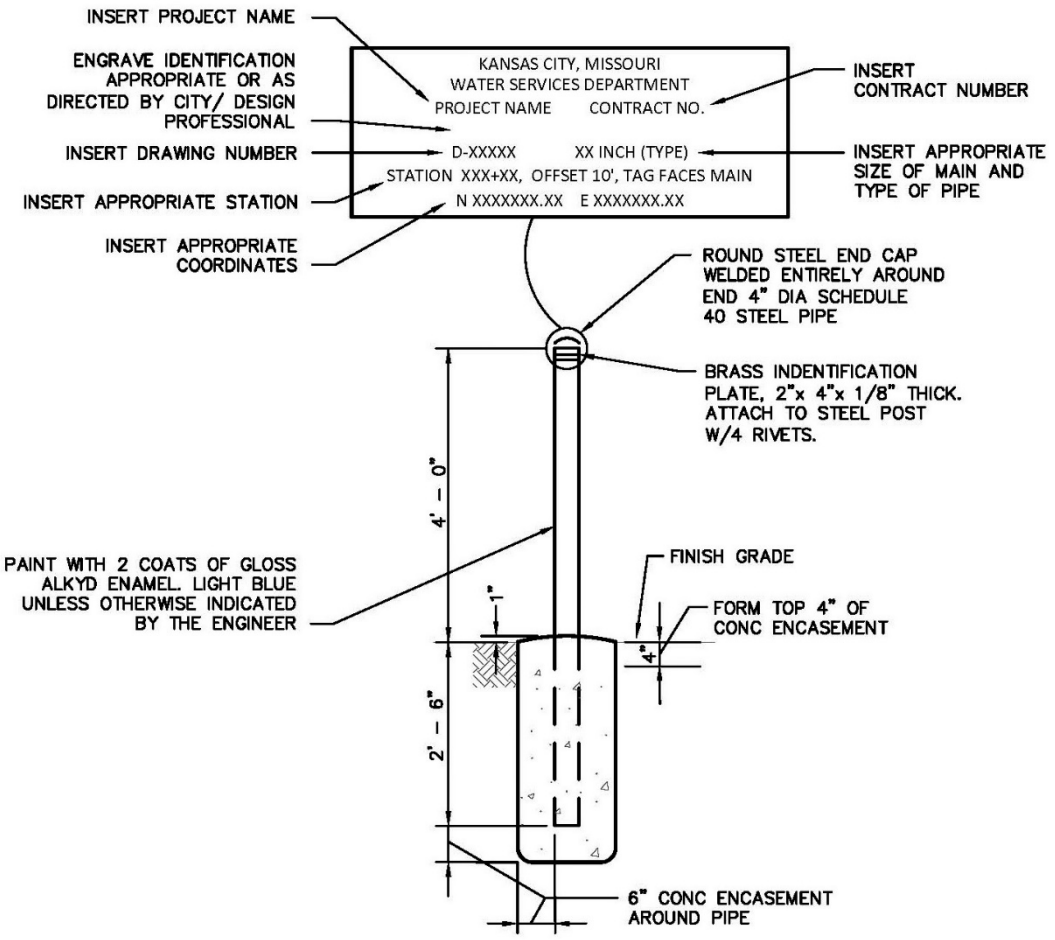
A. Pipeline markers as shown in Construction Detail Drawing No. 01000-1 shall be installed at the locations shown on the Drawings.

B. Contractor shall field verify Stations and Locations for pipeline markers to comply with actual construction. The Contractor shall coordinate labeling with the City/Design Professional prior to fabricating the marker plates. The Contractor shall submit as required in Section 01300 – Submittals.

PART 2 - PRODUCTS
Not used.

PART 3 - EXECUTION
Not used.

Drawing No. 01000-1 on the following page.



NOTES:

1. PIPELINE MARKERS AS SHOWN IN THIS DETAIL SHALL BE INSTALLED AT THE LOCATIONS SHOWN ON THE DRAWINGS.
2. CONTRACTOR SHALL VERIFY STATIONS AND LOCATIONS FOR PIPELINE MARKERS TO COMPLY WITH ACTUAL CONSTRUCTION, AND SHALL COORDINATE LABELING WITH CITY/ DESIGN PROFESSIONAL PRIOR TO FABRICATING AND INSTALLING PIPELINE MARKERS. SUBMIT AS REQUIRED IN SECTION 01300–SUBMITTALS.

PIPELINE MARKER

WATER SERVICES
CITY OF KANSAS CITY, MISSOURI
DRAWING NO. 01000-1

DEVELOPED BY: TECHNICAL ADVISORY COMMITTEE
APPROVED BY:
DATE: 9/02/2021

1 OF 1

END OF SECTION

Section 01015 - WORK COVERED BY CONTRACT DOCUMENTS

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. Demolishing the sites as indicated on the Drawings and within the Sections.

2. Removing portions of the common wall for the emergency overflow weirs and common diversion opening to the North Culvert.

3. Installation of a bending weir within the south box culvert. Including installation of weir wall to support the bending weir.

4. Modifications within the north and south box culverts. Including structural modifications (scab wall, beams, and haunch), openings within the common wall (emergency overflow weirs and diversion to the north box culvert) and repair of openings within the common wall as indicated on the drawings.

5. Fill in the south rock box. Including structural fill, rerouting of utilities from the south rock box to the north rock box, and sealing the structure.

6. Installation of a rock box recirculation system. Including connection to the Turkey Creek Pump Station effluent discharge line, clog-prevention and clean-out services, and structural modifications to the Turkey Creek Pump Station and the north rock box.

7. Modifications to the access structure including the installation of stairs and landing, handrails, exterior lighting, and replacement of the grating.

8. Modifications to the existing gate structure operating scenarios to include the bending weir installed under this project.

9. Instrumentation and controls for monitoring the performance of the bending weir including modifications to the Gate Structure to operate with the Bending Weir.

10. Providing the flow capacity to maintain flow from the box culvert to the Turkey Creek Pump Station and during wet weather flow to the Outfall.

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 with the following:

1. KC Water

1.5 WORK BY PUBLIC UTILITIES

1. 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.

2. Connections to existing facilities that are in service shall be planned 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 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.

3. Service interruption or temporary service is to be provided by the Contractor at their expense. The Contractor shall notify, 24 hours in advance, all WSD customers affected by the work of making connections as to the time of day and the span of time required to make said connections. When the closing of a valve to make the connections affects a customer who cannot be without service, the Contractor shall arrange to supply temporary service and schedule the time that is most convenient to the customer for making the connection to the existing mains.

4. There should be no fees associated with the work performed by WSD.

1.6 WORK BY City

A. City shall perform certain activities in connection with the Project with its own personnel as follows:

1. Operation of the Turkey Creek Pump Station and Gate Structure.

a. Any operation of existing valves and gates within the Turkey Creek Pump Station, Gate structure or in the yard surrounding the Turkey Creek Pump Station (refer to Operational Change Control Plan section).

1.7 PROCUREMENT CONTRACTS. Not used.

1.8 ITEMS FURNISHED BY City. Not used.

1.9 PIPELINE MATERIALS TO BE FURNISHED BY City. Not used.

1.10 RESPONSIBILITY FOR MATERIALS AND EQUIPMENT.

A. Items Furnished by City – Not used.

B. Items Furnished by Contractor.

1. Contractor shall be fully responsible for all materials and equipment which it has furnished.

C. Delivery and Handling of Items Furnished by City – Not used.

1.11 OFFSITE STORAGE.

A. Offsite storage arrangements shall be approved by City 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 City and Engineer.

1.12 SUBSTITUTES AND "OR-EQUAL" ITEMS

A. Provisions for evaluation of proposed "or-equal" items of materials or equipment are covered in Paragraph 7.04 of the General Conditions. Provisions for evaluation of proposed substitute items of materials or equipment are covered in Paragraph 7.05 of the General Conditions. Requests for review of equivalency will not be accepted by

Engineer from anyone except Contractor, and such requests will not be considered until after the Effective Date of the Agreement.

1.13 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.

B. Whenever the names of proprietary products or the names of particular manufacturers or vendors are used, it shall be understood that the words "or equal" following the enumeration, if not specifically stated, are implied.

1.14 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.

1.15 SALVAGE OF MATERIALS AND EQUIPMENT.

A. Existing materials and equipment removed shall become Contractor's property.

B. Existing materials and equipment removed by Contractor shall not be reused in the Work.

1.16 LAND FOR CONSTRUCTION PURPOSES.

A. Contractor will be permitted to use available land belonging to City, 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 City, requiring access to the storage area. Materials or equipment shall not be placed on the property of City until City has agreed to the location to be used for storage.

1.17 EASEMENTS AND RIGHTS-OF-WAY.

A. The easements and rights-of-way for the pipelines will be provided by City. 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.

B. On Private Property.

1. Easements across private property are indicated on the Drawings.

2. Contractor shall set stakes to mark the boundaries of construction easements across private property.

3. Contractor shall furnish, without charge, competent persons and such tools, stakes, and other materials as Engineer may require in staking out the boundaries of construction easements.

4. Contractor will not be required to provide an instrument person.

5. The stakes shall be protected and maintained until completion of construction and cleanup.

C. Contractor shall not enter any private property outside the designated construction easement boundaries without written permission from the City of the property.

D. Work Within Highway and Railroad Rights-of-Way. Not used.

1.18 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 City in advance, portions of the existing facilities may be taken out of service for short periods corresponding with periods of minimum service demands. Refer to the special requirements paragraph for minimum pump around flow considerations.

B. Contractor shall provide temporary facilities and make temporary modifications as necessary to keep the existing facilities in operation during the construction period.

1.19 SPECIAL REQUIREMENTS

A. Operational Requirements. Contractor shall schedule and conduct the work in accordance with the following requirements:
   1. Contractor shall be responsible for all safety precautions necessary to perform the work, including but not limited to shoring, trench safety procedures, lighting, and personnel harnesses and safety lines when necessary, in accordance with General Conditions, paragraph 6.11 and as per OSHA requirements.
      a. The culverts associated with the Work is considered a “Confined Space”. Take all safety precautions and provide workers with necessary equipment and proper ventilation for the environment.
   2. The Contractor is responsible for maintaining a minimum flow rate of 20 mgd from the box culvert (north and south) to the Turkey Creek Pump Station at all times. All costs associated with the weir installation, culvert improvements, site specific demolition, and any other task which necessitates the need for temporary diversion pumping, line stops, or any other method used to keep the station in continuous operation while the Work is being performed is to the account of the contractor. Contractor will account for all related costs in their bid.
   3. Prior to the start of structural modifications, evaluation of the existing concrete shall be taken at the locations of the proposed openings and submitted to Engineer for testing by the City. Testing requirements for the core samples are outlined in the structural drawings. Contractor shall schedule testing such that results of the testing shall be submitted to the Engineer prior to approval for concrete and rebar submittals. Based on results, Engineer may propose modifications to the reinforcement design.

1.20 NOTICES TO CITYS AND AUTHORITIES

A. Contractor shall, as provided in the General Conditions, notify Citys 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.

1.21 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 will be established or designated by 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 keep Engineer informed, a reasonable time in advance, of the times and places at which it wishes to do Work, so that horizontal and vertical control points may be established and any checking deemed necessary by Engineer may be done with minimum inconvenience to Engineer and minimum delay to Contractor.

E. Contractor shall remove and reconstruct work which is improperly located.

1.22 ALLOWANCES. Not Used.

1.23 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 City 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.

1.24 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.

1.25 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. Refer to the structural drawings for considerations for sequence of construction.

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.

1.26 HAZARDOUS ENVIRONMENTAL CONDITIONS AT SITE

A. No Hazardous Environmental Conditions at the Site in areas that will be affected by the Work are known to the City.

1.27 CLEANING UP

A. Contractor shall keep the premises free at all times from accumulations of waste materials and rubbish. Contractor shall provide adequate trash receptacles about the Site and shall promptly empty the containers when filled.

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.

1.28 APPLICABLE CODES

A. References in the Contract Documents to local codes mean the following:

1. The 2018 International Building Code with local amendments.

B. Other standard codes which apply to the Work are designated in the Specifications.

1.29 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 City, 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 City, 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.

1.30 ALTERNATES. Not used.

1.31 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 City.

6. Government representatives as appropriate.

7. Others as requested by Contractor, City, 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 City'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.

1.32 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.

1.33 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 City 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 City's employees) to observe the same regulations as Contractor requires of its employees.

1.34 NONSMOKING BUILDING.

A. Contractor’s personnel shall not smoke within the building or within 25 feet of entrances, operable windows, or outdoor air intakes for the building. This requirement shall be enforced from the beginning of construction of the super structure.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

End of Section

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 SPECIFICATION MODIFICATIONS

A. It is understood that throughout this section these Specifications may be modified by appropriate items in Section 01015 – Specific Project Requirements or as otherwise indicated on the Contract Drawings.

1.03 RELATED SECTIONS

A. Section 00700 – General Conditions.

B. Section 01015 – Specific Project Requirements.

C. Section 01300 – Submittals.

D. Section 01335 – Document Management.

E. Section 02686 – CCTV Inspection.

1.04 CODES AND STANDARDS

A. CAD Standards – United States National CAD Standards.

1.05 DEFINITIONS

A. Drawings – As defined by Section 00700 – General Conditions.

B. Approved for Construction Drawings – Any drawing or sketch that has been issued to the Contractor by the City for the purposes of constructing the Work. These include, but are not limited to, the following: Drawings, revisions to the Drawings, information issued as part of change orders and information issued as part of work change directives.

C. Field-Marked Drawings (Red Line Markups) – A copy of the Approved for Construction Drawings that is maintained and updated daily by the Contractor during construction detailing all work completed and depicting all changes made to the Work during construction.

D. As-Built Drawings – The completed Field-Marked Drawings that include the signed certification language from both the Contractor and Surveyor.

E. Conforming to Construction Drawings – The Approved for Construction Drawings that have been revised to reflect the changes noted on the As-Built Drawings. For these drawings, the CAD files are updated and a new set of drawings is created.

F. Record Drawings – All drawings used or developed as part of the Work. Record Drawings include, but are not limited to, the following: Approved for Construction Drawings, Field-Marked Drawings, As-Built Drawings and Conforming to Construction Drawings.
G. Record Documents – As defined by this Section, Section 01015 and Section 00700 – General Conditions, Article 6 Contractor's Responsibilities.

1.06 INFORMATION PROVIDED BY THE CITY

A. The City will provide the Contractor a suitable copy of the Approved for Construction Drawings in an electronic/CAD format.

1.07 SUBMITTALS

A. Submit as specified in Section 01300 – Submittals.
B. Submittals include, but are not limited to, the following:
   (a) All Record Documents – As required by this Section, Section 1015 and Section 00700 – General Conditions, Article 6, Contractor's Responsibilities, paragraph Record Documents.
   (b) Field-Marked Drawings.
   (c) As-Built Drawings.
   (d) Conforming to Construction Drawings.
   (e) Other Record Documents as requested by the City.

1.08 QUALITY ASSURANCE

A. The Contractor 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 in performing surveys required 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:
   (a) The Contractor 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 (Surveyor).
   (b) Vertical Datum – All elevations shall be indicated in North American Vertical Datum of 1988 (NAVD 88) in feet and decimals of a foot.
   (c) 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.

C. 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.

D. Wastewater Systems:
   (a) New Manholes – A survey is required to verify the location of all new manholes. The survey shall include, but is not limited to, the following:
      (i) 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.
      (ii) Top Elevation. – Provide the elevation of the top of the structure at the Locating Point.
      (iii) 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).
      (iv) Manhole Invert – Provide the elevation of the invert at the center of the manhole if different than the pipe inverts.
   (b) 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:
      (i) 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.
      (ii) Top Elevation – Provide the elevation of the top of the structure at the Locating Point.
      (iii) 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).
      (iv) Manhole Invert – Provide the elevation of the invert at the center of the manhole if different from the pipe inverts.

E. 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:

(i) 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.

(ii) Top Elevation – Provide the elevation of the top of the structure at the Locating Point.

(iii) 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).

(iv) Manhole or Structure Invert – Provide the elevation of the invert at the center of the manhole or structure if different than the pipe inverts.

(b) Culvert:

(i) A survey is required to verify the location of new culverts. The survey shall include, but is not limited to, the following:

(ii) 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.

(iii) Invert – Provide the upstream and downstream invert elevation of each culvert barrel.

(c) Channels and Ditches:

(i) 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.

(ii) 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.

(d) Detention Areas:

(i) 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.

(ii) Enough survey points shall be taken to generate 1-foot contours of the detention or retention area and any containment berms.

(iii) 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.

(iv) 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.

3.02 FIELD-MARKED DRAWINGS

A. The Contractor shall continuously maintain a set of Field-Marked Drawings which details all work completed and shows all changes or deviations made by the Contractor from the Approved for Construction Drawings. Where the Approved for Construction Drawings are not detailed and allow for flexibility during construction, the Contractor 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 important to the City that is not shown on Drawings or Shop Drawings.
D. Note related Change Order numbers where applicable.
E. Include the following:
   (a) Field changes of dimension and detail.
   (b) Changes made by Change Order or other modifications.
   (c) Details not on original Drawings.
   (d) Horizontal and vertical location of all underground utilities and all other concealed elements that would complicate and make difficult/expensive to maintain the installed asset at a later date.
F. 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.
G. Field changes or additions shall be designated in RED. Hard copy and electronic (PDF) deliverables shall be provided in color.
H. Information shall be clearly distinguishable on hard copy mark-ups and in the electronic files.
I. If the Contractor observes inaccurate information pertaining to existing conditions, the correct information shall be noted in the Field-Marked Drawings.
J. The Contractor 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.

3.03 AS-BUILT DRAWINGS

A. Upon completion of the Work and before the Application for Final Payment, the Contractor shall prepare the As-Built Drawings by completing annotations to the Field-Marked Drawings and adding the required certification statements.
B. Surveyor's Certification:
   (a) Each drawing shall be modified to include a certification statement and signature block as described below.
   (b) 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:

      (i) 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.

(ii) Wastewater, Storm Water and Green Infrastructure 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. These Records have been revised under my personal supervision to show the true and accurate measurements of the work as it was actually constructed.

C. Contractor's Certification:
   (a) Each drawing shall be modified to include a certification statement and signature block as described below.
   (b) The Contractor shall provide certification that the Field-Marked Drawings reflect the conditions that were constructed.
   (c) The Contractor shall review the Field-Marked Drawings and verify all information is accurate. The Contractor shall verify that all changes to the Work have been documented. The Contractor shall sign each sheet of the Record Drawings with the following certification(s):

(i) 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: _____

(ii) 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: _____

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 submits the Application for Final Payment.

E. Mark each document "AS-BUILT DRAWINGS" in neat, large print letters.
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.

3.04 CONFORMING TO CONSTRUCTION DRAWINGS

A. The Contractor shall prepare Conforming to Construction Drawings as required by this Section and Section 01015 – Specific Project Requirements.
B. Conforming to Construction Drawings shall be submitted and accepted by the City before the Contractor may submit the Application for Final Payment.
C. The Contractor 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.
D. Version – CAD drawings shall be developed and submitted in the latest version of AutoCAD® .dwg format or AutoCAD® Civil 3D. See Section 01015 – Specific Project Conditions for additional information regarding CAD formats and standards.
E. CAD Standards – Comply with United States National CAD 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:
   (a) Project Name.
   (b) WSD Project Number.
   (c) WSD Work Order Number.
   (d) WSD Drawing Number.
   (e) Date of publication.
I. Submittals – Submit Conforming to Construction Drawings in accordance with paragraph SUBMITTALS.

3.05 OTHER RECORD DOCUMENTS

A. As defined by Section 00700 – General Conditions, Article 6 – Contractor’s Responsibilities.
B. Coordinates Table – Provide a Microsoft Excel spreadsheet that contains the coordinates of every asset installed or adjusted as part of the Work.
C. Survey Cut Sheets.
D. Television Inspection data files as specified in Section 02686 – CCTV Inspection.
E. Other information as specified in Section 01015 – Specific Project Requirements.

3.06 DELIVERABLES AND SUBMITTALS

A. Electronic Submittals:
   (a) All electronic deliverables (drawings, coordinates table, etc…) shall be made through the approved document management system. See Section 01335 – Document Management.
B. As-Built Drawings:
   (a) One (1) hard copy on paper for review and approval.
   (b) One (1) electronic copy in PDF format.

(c) One (1) electronic copy in the latest version of AutoCAD® .dwg format.

C. 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.

D. Record Documents:
   (a) Submit Record documents in accordance with Section 00700 – General Conditions, Article 14 – Payments to the Contractor and Completion.
   (b) Submit other documents as required by paragraph 3.05 OTHER RECORD DOCUMENTS of this section.
   (c) One (1) hard copy on paper.
   (d) One (1) electronic copy in PDF format.
   (e) As specified in other sections.

E. Electronic (PDF) Documents:
   (a) Documents shall be full scale.
   (b) Markups shall be noted in RED.
   (c) Minimum resolution shall be 600 dpi.

3.07 CORRECTIONS DURING THE WARRANTY PERIOD

A. The Record Documents shall be an integral part of the work guaranteed by the Contractor'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 shall make or cause the revisions or corrections to be made at no additional cost to the City.

END OF SECTION

SECTION 01210 – ALLOWANCES

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including SECTION 00700-GENERAL CONDITIONS and SECTION 00800 – SUPPLEMENTARY CONDITIONS and other Specification Sections, apply to this section.
B. Form 00413 Allowance Form.
C. Form 01210.01 Allowance Authorization.

1.2 SUMMARY

A. This section includes administrative and procedural requirements governing allowances.
B. The allowance is miscellaneous items not otherwise identified for repair and/or replacement on the Contract Drawings or Specifications.
C. Funds will be drawn from the allowance by issuance of Form 01210.01 Allowance Authorization.
D. At Project closeout, unused amounts remaining in the allowance will be credited to the Owner by Change Order.

1.3 PROPOSALS

A. At Owner's request, the Contractor shall prepare a written proposal with cost breakdown for each proposed work assignment under the allowance. Include recommendations that are relevant to performing the work.
B. Contractor shall not proceed with allowance work until Owner issues an Allowance Authorization.

1.4 PREPARATION

A. Contractor shall complete each authorized item in accordance with the standard specification within the Project Manual.
B. Contractor shall coordinate with Water Services Engineer and Resident Inspector prior and obtain written approval prior to using the allowance.

1.5 SCHEDULE OF ALLOWANCES

A. To complete miscellaneous Work not specifically identified in the Contract Documents.

End of Section.

CITY OF FOUNTAINS
HEART OF THE NATION

KANSAS CITY
MISSOURI

ALLOWANCE AUTHORIZATION

Project/Contract 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

_____
Project Manager Date

CITY APPROVAL

_____
City's Representative Date

CONTRACTOR ACCEPTANCE

_____
Contractor Date

❑ Attachments:

Distribution:
- ❑ City
- ❑ Contractor
- ❑ Construction Manager
- ❑ Design Professional
- ❑ Consultant
- ❑ Other

CITY OF FOUNTAINS
HEART OF THE NATION
KANSAS CITY
MISSOURI

APPLICATION FOR PAYMENT

Project Number _____

Project Title _____

Final Payment[5] ☐

Application Number[2]: _____

CONTRACTOR — Date: _____

Ordinance/Resolution Number: _____

Address — 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 Number _____

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 Kansas City, Missouri

Certified Payroll Report Instructions

GENERAL INSTRUCTIONS:

Each space on the attached Certified Payroll Report requiring information is numbered. The numbers below correspond to those spaces. When completing the Certified Payroll Report, insert the required information in each space. The Certified Payroll Report **must be complete, clear and legible** and be accompanied by a completed Payroll Certification including **original signature**. All payrolls are to be submitted within two (2) weeks after the ending date of the payroll week.

The payroll form is available on line.

INSTRUCTION FOR PAYROLL SHEETS

1. **PAYROLL NUMBER**: Insert the number of the payroll. Payrolls start with number 1 (one) for the first week of work by each contractor or subcontractor. The numbers are then continuous until the last payroll. During weeks when no work takes place a payroll for that week showing no work is to be turned in. Revised payrolls must be designated with a letter "R" following the number. Check (✓) the box by the word "FINAL" after the number to indicate that no further work will be done by the contractor or subcontractor.

2. **WEEK ENDING**: On each sheet, insert the date of the last day of this payroll.

3. **SHEET OF**: On each sheet, insert the number of each sheet and the total number of sheets submitted.

4. **GRANT AGENCY PROJECT NO:** Insert the Grant Agency Project Grant Number if this is a grant funded project.

5. **CONTRACTOR**: Insert the contractor's company name and address.

6. **SUBCONTRACTOR**: If this is a payroll for a subcontractor, insert subcontractor's name and address. For the remainder of these instructions, the word "contractor" shall apply to both contractor and subcontractor.

7. **DEPARTMENT PROJECT or CONTRACT NO**: Insert Department's Project or Contract Number.

8. **LOCATION**: Insert location of work, including address, and county.

9. **DESCRIPTION**: Insert name of the project or contract from the Agreement.

10. **FEDERAL I.D. NUMBER**: Insert the contractor (10a) and subcontractor's (10b) Federal I.D. Number.

11. **EMPLOYEE NAME**: Insert employee's full legal name and complete home address. Make sure to include Apartment #'s and zip code.

12. **SOCIAL SECURITY NO**.: Insert employee's social security number (xxx-xx-xxxx).

13. **DATE**: Insert date for each day of the payroll week for each employee (mm/dd/yyyy).

14. **REGULAR HOURS***: Insert the regular hours worked each day.

15. **OVERTIME HOURS***: Insert the overtime hours worked each day.

16. **DOUBLE OVERTIME HOURS*:** Insert the double overtime hours worked each day.

    ***Note:** Numbers 14, 15, and 16: Make sure these **hours are equal to or greater than the hours turned in on the "Daily Labor Force Report" form.** Refer to the wage order for applicable overtime schedule.

    If allowed by occupational title's applicable overtime rate, Contractor may make a permanent schedule transfer to an eight (8) or ten (10) hour day work week. **Advance written notification to and approval** from the Owner's Representative **is required**.

    If allowed by the occupational title's applicable overtime rate, any change in the work week schedule due to inclement weather **must** be documented on the certified payroll.

17. **TOTAL HOURS**: Insert total of *regular hours* worked for the week on this project. (The total hours will calculate automatically if you are using the electronic form.)

18. **TOTAL HOURS**: Insert total of *overtime hours* worked for the week on this project. (The total hours will calculate automatically if you are using the electronic form.)

19. **TOTAL HOURS:** Insert total of *double overtime* hours worked for the week on this project. (The total hours will calculate automatically if you are using the electronic form.)

20. **TOTAL FRINGE HOURS**: Insert total Fringe Hours (by adding the amounts in 17, 18, and 19). (The total hours will calculate automatically if you are using the electronic form.)

21. **BASE RATE***: Insert basic hourly rate of pay. Check the contract's "Annual Wage Order" or the "Federal General Wage Decision" section for basic hourly rate.

22. **OVERTIME RATE***: Insert overtime rate of pay. Check the contract's "Annual Wage Order" or the "Federal General Wage Decision" section for the overtime rate.

23. **DOUBLE OVERTIME RATE***: Insert double overtime rate of pay. Check the contract's "Annual Wage Order" or the "Federal General Wage Decision" section for the double overtime rate.

24. **FRINGE RATE***: Insert fringe benefit rate for this project. Check the contract's "Annual Wage Order" or the "Federal General Wage Decision" section for the fringe benefit rate.

    ***Note**: *The total of the basic hourly rate plus the fringe benefit rate must be equal to or greater than the total of the basic hourly rate plus the fringe benefit rate found in the contract's "Annual Wage Order" or the "Federal General Wage Decision" section. If the contract contains both of the above, the higher rate will prevail.*

25. **TOTAL**: Multiply the amounts in 17 by 21 and insert here. (The total hours will calculate automatically if you are using the electronic form.)

26. **TOTAL**: Multiply the amounts in 18 by 22 and insert here. (The total hours will calculate automatically if you are using the electronic form.)

27. **TOTAL**: Multiple the amounts in 19 by 23 and insert here. (The total hours will calculate automatically if you are using the electronic form.)

28. **TOTAL**: Multiply the amounts in 20 by 24 and insert here. (The total hours will calculate automatically if you are using the electronic form.)

29. Check (✓) the box (☐) for the "*APPROVED PLAN*", "*EMPLOYEE",* or both indicating the Plan or manner in which the fringe benefit is paid. If fringe benefit is paid to both a Plan and the employee, then insert each amount that is paid to the Plan and/or the employee. If paid to a Plan, list the name(s) of Plan Programs on Payroll Certification page.

    ***Note:** 29a plus 29b **must equal** 28**.**

30. **OCCUPATIONAL TITLE/CLASSIFICATION**: Insert occupational title/classification of worker for each employee. Examples: Carpenter, laborer, electrician.

31. **GROUP**: Insert the group if, applicable for the occupational title/classification. Example: Operating Engineers Group I, II, III, IV or V.

32. **SKILL GROUP**: Insert skill group, if applicable. Example: general laborer, skilled laborer, first semi-skilled, second semi-skilled etc. or any of the listings under the federal classification such as painters.

33. **HOURS**: Insert total hours worked for all jobs for each employee during each payroll period.

34. **GROSS EARNINGS**: Insert employee's gross earnings for each payroll period.

35. **FEDERAL**: Insert the amount of the deduction from each employee's check stub.

36. **FICA**: Insert the amount of the deduction from each employee's check stub.

37. **STATE**: Insert the amount of the deduction from each employee's check stub.

38. **LOCAL E-TAX**: Insert the amount of the deduction from each employee's check stub.

39. **MISCELLANEOUS**: Insert the amount of the deduction from each employee's check stub.

40. **NET PAY**: Insert the employee's net pay for each week.

41. **EARNINGS FOR THIS JOB**: Add the amounts in 25, 26, 27, and 29b and insert here.

    ***Note**: If fringe benefit is paid to Approved Plan, do not add the amount in 29a to this total.

42. **KANSAS CITY EARNINGS TAX THIS JOB**: Insert Kansas City Earnings tax deducted from employee's check for this job.

Steps 11 through 42 are to be repeated for each employee working on the project site, or for the same employee working any additional Occupational Title/Classification.

CITY OF FOUNTAINS
HEART OF THE NATION
KANSAS CITY
MISSOURI

CERTIFIED PAYROLL REPORT

Project Number:

Project Title:

Payroll Number: (1) ☐ **Final**

WEEK ENDING: (2)		SHEET (3)	of	GRANT AGENCY PROJECT NO.: (4)	
CONTRACTOR: (5)		SUBCONTRACTOR: (6)		DEPT PROJECT OR CONTRACT NO.: (7)	
ADDRESS:		ADDRESS:		LOCATION: (8)	
CITY, STATE ZIP:		CITY, STATE ZIP:		DESCRIPTION: (9)	
FEDERAL I.D. NUMBER: (10a)		FEDERAL I.D. NUMBER: (10b)			

First Name / Last Name	DATE: (13)	MON	TUES	WED	THUR	FRI	SAT	SUN	TOTAL HRS.	BASE RATE	O.T. RATE	FRINGE RATE	TOTAL
EMPLOYEE NAME: (11)													
ADDRESS:	REG. HRS. (14)								(17) 0.00	$ (21) -			$ (25) -
CITY, STATE ZIP:	O.T. HRS. (15)								(18) 0.00		$ (22) -		$ (26) -
SOCIAL SECURITY NO.: (12)	D.O.T. HRS. (16)								(19) 0.00		$ (23) -		$ (27) -
OCCUPATIONAL TITLE / CLASSIFICATION:						TOTAL FRINGE HOURS (20)			0.00			$ (24) -	$ (28) -
(30)											FRINGE PAID TO:	☐ APPROVED PLAN (29a)	
	GROUP: (31)		SKILL GROUP: (32)								(29)	☐ EMPLOYEE	$ (29b) -

WEEK ALL JOBS:	HOURS:	GROSS EARNINGS:	FEDERAL:	FICA:	STATE:	LOCAL E-TAX:	MISC:	NET PAY:	EARNINGS FOR THIS JOB:	$ (41) -
	(33)	$ (34) -	$ (35) -	$ (36) -	$ (37) -	$ (38) -	$ (39) -	$ (40) -	KANSAS CITY EARNINGS TAX THIS JOB	$ (42) -

First Name / Last Name	DATE:	MON	TUES	WED	THUR	FRI	SAT	SUN	TOTAL HRS.	BASE RATE	O.T. RATE	FRINGE RATE	TOTAL
EMPLOYEE NAME:													
ADDRESS:	REG. HRS.								0.00	$ -			$ -
CITY, STATE ZIP:	O.T. HRS.								0.00		$ -		$ -
SOCIAL SECURITY NO.:	D.O.T. HRS.								0.00		$ -		$ -
OCCUPATIONAL TITLE / CLASSIFICATION:						TOTAL FRINGE HOURS			0.00			$ -	$ -
											FRINGE PAID TO:	☐ APPROVED PLAN	$ -
	GROUP:		SKILL GROUP:									☐ EMPLOYEE	$ -

WEEK ALL JOBS:	HOURS:	GROSS EARNINGS:	FEDERAL:	FICA:	STATE:	LOCAL E-TAX:	MISC:	NET PAY:	EARNINGS FOR THIS JOB:	$ -
		$ -	$ -	$ -	$ -	$ -	$ -	$ -	KANSAS CITY EARNINGS TAX THIS JOB	$ -

First Name / Last Name	DATE:	MON	TUES	WED	THUR	FRI	SAT	SUN	TOTAL HRS.	BASE RATE	O.T. RATE	FRINGE RATE	TOTAL
EMPLOYEE NAME:													
ADDRESS:	REG. HRS.								0.00	$ -			$ -
CITY, STATE ZIP:	O.T. HRS.								0.00		$ -		$ -
SOCIAL SECURITY NO.:	D.O.T. HRS.								0.00		$ -		$ -
OCCUPATIONAL TITLE / CLASSIFICATION:						TOTAL FRINGE HOURS			0.00			$ -	$ -
											FRINGE PAID TO:	☐ APPROVED PLAN	$ -
	GROUP:		SKILL GROUP:									☐ EMPLOYEE	$ -

WEEK ALL JOBS:	HOURS:	GROSS EARNINGS:	FEDERAL:	FICA:	STATE:	LOCAL E-TAX:	MISC:	NET PAY:	EARNINGS FOR THIS JOB:	$ -
		$ -	$ -	$ -	$ -	$ -	$ -	$ -	KANSAS CITY EARNINGS TAX THIS JOB	$ -

First Name / Last Name	DATE:	MON	TUES	WED	THUR	FRI	SAT	SUN	TOTAL HRS.	BASE RATE	O.T. RATE	FRINGE RATE	TOTAL
EMPLOYEE NAME:													
ADDRESS:	REG. HRS.								0.00	$ -			$ -
CITY, STATE ZIP:	O.T. HRS.								0.00		$ -		$ -
SOCIAL SECURITY NO.:	D.O.T. HRS.								0.00		$ -		$ -
OCCUPATIONAL TITLE / CLASSIFICATION:						TOTAL FRINGE HOURS			0.00			$ -	$ -
											FRINGE PAID TO:	☐ APPROVED PLAN	$ -
	GROUP:		SKILL GROUP:									☐ EMPLOYEE	$ -

WEEK ALL JOBS:	HOURS:	GROSS EARNINGS:	FEDERAL:	FICA:	STATE:	LOCAL E-TAX:	MISC:	NET PAY:	EARNINGS FOR THIS JOB:	$ -
		$ -	$ -	$ -	$ -	$ -	$ -	$ -	KANSAS CITY EARNINGS TAX THIS JOB	$ -

CITY OF FOUNTAINS
HEART OF THE NATION

KANSAS CITY
MISSOURI

CERTIFIED PAYROLL REPORT

Project Number: _____

Project Title: _____

Payroll Number: _____ **Final**

| | | |

Date _____

I, _____, _____
(Name of Signatory Party) (Title)
do hereby state:

(1) That I pay or supervise the payment of the persons employed by (Contractor or subcontractor)_____ on the (Building or work)_____: that during the payroll period commencing on the _____ day of _____, 20___, and ending the _____ day of _____, 20___, all said persons employed on said project have been paid the full weekly wages earned, that no rebates have been or will be made either directly or indirectly to or on behalf of said (Contractor or subcontractor) _____from the full weekly wages earned by any person and that no deductions have been made either directly or indirectly from the full wages earned by any person, other than permissible deductions as defined in Regulations, Part 3 (29 CFR Subtitle A), issued by the Secretary of Labor under the Copeland Act, as amended (48 Stat. 948.63 Stat. 108, 72 Stat. 967; 76 Stat. 357; 40 U.S.C. 276c), and described below:

_____
_____
_____
_____

(2) That any payrolls otherwise required under this contract to be submitted for the above period are correct and complete; that the wage rates for laborers or mechanics contained herein are not less than the applicable wage rates contained in any wage determination incorporated into this contract; that the classifications set forth herein for each laborer or mechanic conform to the work he performed.

(3) That any apprentices employed in the above period are duly registered in a bona fide apprenticeship program registered with a State apprenticeship agency recognized by the Bureau of Apprenticeship and Training, United States Department of Labor, or if no such recognized agency exists in a State, are registered with the Bureau of Apprenticeship and Training, United States Department of Labor.

(4) That:

(a) WHERE BENEFITS ARE PAID TO APPROVED PLANS, FUNDS, OR PROGRAMS

❑ In addition to the basic hourly wage rates paid to each laborer or mechanic listed in the above referenced payroll, consisting of _____ pages, payments of fringe benefits as listed in the contract have been or will be made to appropriate programs for the benefit of such employees, exceptions noted in 4 (c) below.

(b) WHERE BENEFITS ARE PAID IN CASH

❑ Each laborer or mechanic listed in the above referenced payroll, consisting of _____ pages, has been paid, as indicated on the payroll, in an amount not less than the sum of the basic hourly wage rate plus the amount of the required fringe benefits as listed in the contract, except as noted in Section 4 (c) below.

(c) EXCEPTIONS

EXCEPTION (CRAFT)	EXPLANATION
REMARKS	

NAME AND TITLE	SIGNATURE
The willful falsification of any of the above statements may subject the contractor or subcontractor to civil or criminal prosecution. See Section 1001 of Title 18 Section 231 of Title 31 of the United States Code.	

CITY OF FOUNTAINS
HEART OF THE NATION

KANSAS CITY
MISSOURI

SUBCONTRACTORS AND MAJOR MATERIAL SUPPLIERS LIST

Project Number _____ Project Title _____

From Contractor _____ To _____ Date _____

Spec. No.	Section Title		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 Number _____ Day _____ Date _____
Project Title _____
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 Number _____

Project Title _____

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
DEPUTY DIRECTOR	BY	DATE

Distribution:
- ❑ Smart Sewer Officer
- ❑ Smart Sewer Division Head
- ❑ Contractor
- ❑ Construction Manager
- ❑ Design Professional
- ❑ Consultant _____
- ❑ Other _____

CITY OF FOUNTAINS
HEART OF THE NATION

KANSAS CITY
MISSOURI

PUNCH LIST

Project Number _____

Project Title _____

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 Number _____

Project Title _____

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

SECTION 01300 – SUBMITTALS

PART 1 - GENERAL

1.01 SUMMARY

A. This section provides for the submittals required by the City prior to the start of work and, as required, for the duration of the Work.

B. All submittals shall be clearly identified by reference to a specification section and/or detail drawing. Submittals shall be clear and legible and shall include sufficient presentation of the data.

C. No portion of the work requiring a shop drawing, product data or sample shall be started nor shall any materials be fabricated or installed prior to the completion of the submittal process described herein. Fabrication performed, materials purchased or on-site construction accomplished prior to completing the submittal process as defined herein shall be at the Contractor's sole risk. The City shall not be liable for any expense or delay to complete the submittal process.

1.02 RELATED SECTIONS

A. Section 00700 – General Requirements:
   1. Article 2, paragraph 2.07.B.1 – Preliminary Project Schedule.
   2. Article 2, paragraph 2.07.B.2 – Preliminary Schedule of Shop Drawings.
   3. Article 2, paragraph 2.07.B.3 – Preliminary Schedule of Values.
   4. Article 6, paragraph 6.04 – Progress Schedule.
   5. Article 6, paragraph 6.05 – Recovery Schedule.
   6. Article 6, paragraph 6.06 – Substitute and "Or-Equal" Items.
   7. Article 6, paragraph 6.15 – Safety Representative.
   8. Article 6, paragraph 6.18 – Shop Drawings and Samples.

B. Section 01015 – Specific Project Requirements.

C. Section 01335 – Document Management.

1.03 GENERAL INFORMATION

A. Definitions:
   1. Shop Drawings, product data and Samples are technical Submittals prepared by the Contractor, Subcontractor, manufacturer or Supplier and submitted by Contractor to the City/Design Professional for review and comment as a basis of the use of Equipment and Materials proposed for incorporation in the Work or needed to describe installation, operation, maintenance or technical properties, as specified in each Division of the Specifications:
      (a) Shop Drawings include custom-prepared data of all types including drawings, diagrams, performance curves, material schedules, templates, instructions and similar information.
      (b) Product data includes standard printed information on materials, products and systems; not custom-prepared for this Project, other than the designation of selections from available choices.
      (c) Samples include both fabricated and physical examples of materials, products and Work; both as complete units and as smaller portions of units of Work; either for limited visual inspection or (where indicated) for more detailed testing and analysis. Mock-ups are a special form of Samples which are too large to be handled in the specified manner for transmittal of Sample Submittals.

2. Informational Submittals are those technical reports, administrative Submittals, certificates and guarantees not defined as Shop Drawings, product data or Samples:
   (a) Technical reports include laboratory reports, tests, technical procedures, technical records and Contractor's design analysis.
   (b) Administrative Submittals are those nontechnical Submittals required by the Contract Documents or deemed necessary for administrative records. These Submittals include maintenance agreements, bonds, project photographs, physical work records, statements of applicability, copies of industry standards, project record data, schedules, security/protection/safety data and similar type Submittals.
   (c) Certificates and guarantees are those Submittals on Equipment and Materials where a written certificate or guarantee from the manufacturer or Supplier is required in the Contract Documents.

B. Quality Requirements:
   1. The Contractor shall submit Shop Drawings and Samples in accordance with Section 00700, paragraph 6.18.C Submittal Procedures.
   2. Submittals such as Shop Drawings and product data shall be of suitable quality for legibility and reproduction purposes. Every line, character and letter shall be clearly legible. Drawings shall be useable for further reproduction to yield legible hard copies.
   3. Documents submitted to the City/Design Professional that do not meet "NO EXCEPTIONS NOTED" to the specified requirements shall be subject to rejection by the City/Design Professional and upon request by the City/Design Professional, the Contractor shall resubmit documents. Submittals shall be corrected, retraced, redrawn or replaced, as may be necessary, to meet the "NO EXCEPTIONS NOTED" requirements. Contractor's failure to initially satisfy Submittal requirements will not relieve the Contractor from meeting the required schedule for Submittals.
   4. All submittals by subcontractors shall be sent directly to the Contractor for checking. The Contractor shall be responsible for their submission at the proper time to prevent delays.
   5. The Contractor shall check all subcontractors' submittals regarding measurements, sizes, materials and details to determine and verify that they meet the requirements of the Contract Documents. Submittals found to be inaccurate or otherwise in error shall be returned to the subcontractors for correction before submission thereof.
   6. Certificates of Compliance – Where indicated in these specifications, each submittal shall include a certificate of compliance prepared by the manufacturer or Supplier of the submitted data, certifying that the item covered complies with Contract Documents. The certificate of compliance shall be a separate document and shall include identification of all deviations, if any, from the Contract Documents.

C. Submittal Completeness:
   1. The Contractor shall accept full responsibility for the completeness of each submission. When an item consists of components from several sources, the Contractor's initial submittal on the item shall include all components.
   2. Submittals shall be complete with respect to dimensions, design criteria, materials of construction and other information specified to enable the City/Design Professional to review the information effectively.
   3. Where standard drawings are furnished which cover several variations of the general class of Equipment, each drawing shall be annotated to indicate exactly which parts of the drawing apply to the Equipment being furnished. Use hatch marks to indicate variations that do not apply to the Submittal. The use of "highlighting markers" will not be an acceptable means of annotating Submittals. Annotation shall also include proper identification of the Submittal permanently attached to the drawing.

4. Reproductions or copies of Contract Drawings or portions thereof will not be accepted as complete fabrication or erection drawings. The Contractor may use a reproduction of Contract Drawings for erection drawings to indicate information on erection or to identify detail drawing references. Whenever the Drawings are revised to show this additional Contractor information, the Design Professional's title block shall be replaced with Contractor's title block and the Design Professional's professional seal shall be removed from the drawing. The Contractor shall revise these erection drawings, as needed, for subsequent Design Professional revisions to the Contract Drawings.

D. Form of Submittals:
   1. Submittals and other Project documents shall be transmitted in electronic format and non-electronic format as specified.
   2. Electronic Format:
      (a) Transmit Submittals and Project documents utilizing:
         (i) Adobe ".pdf" files created directly from native electronic format or City-approved equal file type and format.
         (ii) Electronic submittal ".pdf" files are not to be combined files or collections of files/drawings. Each drawing document must stand alone.
         (iii) Each file will be right reading and oriented the same for all consecutive resubmissions.
         (iv) For any given Submittal, the filename and format shall be consistent for initial submission and subsequent revisions of the same. Use consistent naming convention throughout. Reference to revision or dates shall not be included in a filename.
         (v) Submittals not meeting the above criteria are subject to rejection.
      (b) Provide Project Record Documents, equipment instruction books and operating and maintenance manuals and any other documents, as required, in a file type and format approved by City.
   3. Non-electronic Format:
      (a) Selected Submittals may be provided in paper (hard copy), as well, only with advance approval of the City and using procedures specified herein.
      (b) Equipment instruction books and operating manuals shall be provided in hardcopies in addition to the specified electronic format.
      (c) See also Section 01015 – Specific Project Requirements for a list of Submittals that are to be submitted in hard copy format.

E. Transmittal of Submittals:
   1. All submittals, regardless of origin, shall be stamped with the approval of the Contractor and identified with the name and number of this Contract, Contractor's name, references to applicable specification paragraphs and Contract Drawings and version of the submittal. 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. The Contractor's stamp of approval is a representation to the City and Design Professional that the Contractor accepts full responsibility for determining and verifying all quantities, dimensions, field construction criteria, materials, catalog numbers and similar data, and the Contractor has reviewed and coordinated each submittal with the requirements of the Work and the Contract Documents.

2. Electronic Submittals – The Contractor shall utilize the City's document management system as specified in Section 01335- Document Management for managing, tracking and storing documents associated with the Project. If an internet-based document management system is to be used, additional requirements are provided in Section 01335- Document Management and Section 01015 – Specific Project Requirements. The Contractor shall comply with the file protocols and procedures for the document management system.
3. Non-electronic Submittals – Paper (hard copy) submittals shall be delivered in accordance with Section 01015 – Specific Project Requirements and as specified herein.

F. Submittals Required for the Preconstruction Conference:
1. Following are the minimum required submittals to be provided by the Contractor at the pre-construction conference:
(a) General Requirements:
(i) Preliminary Project Schedule.
(ii) Preliminary Schedule of Shop Drawings.
(iii) Preliminary Schedule of Values.
(iv) Listing of Subcontractors.
(v) Project Sign Request.
(vi) Project letters to be used during the Work.
(vii) Safety Representative.
(b) Project Specific Requirements can be found in Section 01015 – Specific Project Requirements.
(c) Document Management can be found in Section 01335 – Document Management.

1.04 SHOP DRAWINGS AND SAMPLES

A. Shop Drawings:
1. Shop Drawings and engineering data covering all equipment and fabricated and building materials which will become a permanent part of the Work under this Contract shall be submitted to the City/Design Professional for review as specified herein. The data shall include drawings, descriptive information, sufficient detail to show the kind, size, arrangement and operation of component materials and devices; the external connections, anchorages and supports required; performance characteristics; and dimensions needed for installation and correlation with other materials and equipment.
2. All deviations from the Contract Documents shall be identified on each submittal and shall be tabulated in the Contractor's letter of transmittal. Such submittals shall, as pertinent to the deviation, indicate essential details of all changes proposed by the Contractor (including modifications to other facilities that may be a result of the deviation) and all required piping and wiring diagrams.

B. Product Data:
1. Product data as specified in individual Sections, include, but are not necessarily limited to, standard prepared data for manufactured products (sometimes referred to as catalog data), such as the manufacturer's product specification and installation instructions, availability of colors and patterns, manufacturer's printed statements of compliances and applicability, roughing-in diagrams and templates, catalog cuts, product photographs, standard wiring diagrams, printed performance curves and operational-range diagrams, production or quality control inspection and test reports and certifications, mill reports, product operating and maintenance instructions and recommended spare-parts listing and printed product warranties, as applicable to the Work.

2. If applicable, submittals for equipment shall include a listing of all installations where identical or similar equipment has been installed and been in operations for a period of at least one year.
3. Certificates are statements printed on the manufacturer's or supplier's letterhead and signed by responsible officials of manufacturer of product, system or material. Certifications shall provide a clear statement that the product, system or material meets the specified requirements of Contract Documents. All certificates shall be dated after the Effective Date of the contract and shall clearly indicate the project name and project number.

C. Samples:
1. Samples specified in individual Sections, include, but are not necessarily limited to, physical examples of the work such as sections of manufactured or fabricated work, small cuts or containers of materials, complete units of repetitively-used products, color/texture/pattern swatches and range sets, specimens for coordination of visual effect, graphic symbols and units of work to be used by the City/Design Professional for independent inspection and testing, as applicable to the Work.

D. Instruction Books and Operating and Manuals:
1. Contractor shall submit all Operation and Maintenance Data and Manuals as required by the Operation and Maintenance Data Specification in electronic and non-electronic form.
2. The Requirements of this specification also applies to the submittal and review of the Operation and Maintenance Data and Manuals.
3. In addition to electronic Submittals specified, non-electronic (hard copy) Equipment instruction books and operating manuals prepared by the manufacturer shall include the following:
   (a) Index and tabs.
   (b) Instructions for installation, start-up, operation, inspection, maintenance, parts lists and recommended spare parts and data sheets showing model numbers.
   (c) Applicable drawings.
   (d) Warranties and guarantees.
   (e) Address of nearest manufacturer-authorized service facility.
   (f) All additional data specified.
4. Information listed above shall be bound into hard-back binders of three-ring type. Sheet size shall be 8-1/2 x 11. Binder color shall be black. Capacity shall be a minimum of 1-1/2 inches, but sufficient to contain and use sheets with ease. Provide the following accessories:
   (a) Label holder.
   (b) Business card holder.
   (c) Sheet lifters.
   (d) Horizontal pockets.
5. The following information shall be imprinted, inserted or affixed by label on the binder front cover:
   (a) City's Name and Department name.
   (b) City's facility or plant name.
   (c) Equipment item name.
   (d) Volume number (if applicable).
   (e) Contract number.
   (f) Manufacturer's name and address.
6. The following information shall be imprinted, inserted or affixed by label on the binder spine:
   (a) Equipment item name.

(b) City's Name and Department.
(c) City's facility or plant name.
(d) Manufacturer's name.
(e) Contract number.
(f) Volume number (if applicable).

7. Submit mockup of cover and spine for the City/Design Professional's review.

E. Survey Data:

1. All field books, notes, videotapes and other data developed by Contractor in performing surveys required as part of the Work shall be available to City/Design Professional for examination throughout the construction period.
2. All such data shall be submitted to the City/Design Professional with the other documentation required for final acceptance of the Work.

1.05 CITY/DESIGN PROFESSIONAL'S REVIEW OF DRAWINGS AND DATA

A. The City/Design Professional's review of drawings and data submitted by Contractor will cover only general compliance with the Construction Contract Documents. The City/Design Professional's review does not indicate a thorough review of all dimensions, quantities and details of the material, equipment, device or item shown. The City/Design Professional's review shall not relieve Contractor of Contractor's responsibility for errors, omissions or deviations in the drawings and data, nor of sole responsibility for compliance with the Construction Contract Documents.

B. The City/Design Professional's submittal review period shall be 21 consecutive calendar days in length and shall commence on the first calendar day immediately following the date of arrival of the submittal or resubmittal in the City/Design Professional's office. The time required to mail the submittal or resubmittal back to Contractor shall not be considered a part of the submittal review period. Submittals shall be returned to the Contractor under one of the following assignments:

1. "NO EXCEPTIONS NOTED" is assigned when there are no notations or comments on the submittal. When returned, the Contractor may release the equipment and/or material for manufacture.
2. "EXCEPTIONS NOTED" is assigned when a confirmation of the notations and comments is not required by the Contractor. The Contractor may release the equipment or material for manufacture; however, all notations and comments must be incorporated into the final product.
3. "RETURNED FOR CORRECTION" is assigned when the submittal does not meet the intent of the Construction Contract Documents. The Contractor must resubmit the document revised to bring the submittal into compliance with Contract Documents. "RETURNED FOR CORRECTION" is also assigned when notations and comments are extensive enough to require a resubmittal of the package.
4. "NOT ACCEPTABLE" is assigned when the submittal does not meet the intent of the Construction Contract Documents. The Contractor must resubmit the entire package revised to bring the submittal into compliance with Contract Documents. It may be necessary to resubmit using a different manufacturer/vendor to meet the Construction Contract Documents. "NOT ACCEPTABLE" is also assigned when the notations and comments are extensive enough to require a resubmittal of the package.

C. If the Contractor considers any correction indicated on the shop drawings to constitute a change to the Contract Documents, the Contractor shall give written notice thereof to the City/Design Professional at least seven working days prior to release for manufacture.

D. Resubmittal of Drawings and Data:
   1. The Contractor shall accept full responsibility for the completeness of each resubmittal. The Contractor shall verify that all corrected data and additional information previously requested by the City/Design Professional are provided on the resubmittal. When corrected copies are resubmitted, the Contractor shall in writing direct specific attention to all revisions and shall list separately any revisions made other than those called for by the City/Design Professional on previous submissions.
   2. 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.) to indicate the sequence of the resubmittal.
   3. Resubmittals shall be made within thirty (30) days of the date of the letter returning the submittal to be modified or corrected; unless, within 14 days, the Contractor submits an acceptable request for an extension of the stipulated period, listing the reasons the resubmittal cannot be completed within the specified time.
   4. Any need for more than one resubmission or any other delay in obtaining the City/Design Professional's review of submittals, will not entitle the Contractor to an extension of the Contract Times, unless: the delay of the Work is directly caused by a change in the Work authorized by a Change Order or by failure of the City/Design Professional to review the submittals within the submittal review period specified herein.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used

END OF SECTION

SECTION 01320 – CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes administrative and procedural requirements for documenting the construction process beginning with the Notice of Intent to Contract and continuing through completion of the Work performed and Construction Contract close out.

B. The Contractor shall furnish all labor, materials, equipment and incidentals as necessary to comply with these requirements including but not limited to the following and as required herein:
   1. Preliminary Project Schedule.
   2. Project Baseline Schedule.
   3. Progress Schedule.
   4. Recovery Schedules.
   5. Submittals Schedule.
   6. Daily Labor Force reports.
   7. Material location reports.
   8. Field condition reports.
   9. Special reports.
   10. Photographic Documentation.

1.02 SPECIFICATION MODIFICATIONS

A. It is understood this specification may be modified by appropriate items in Section 01015 – Specific Project Requirements.

1.03 RELATED SECTIONS

A. Drawings and general provisions of the Contract; including General and Supplementary Conditions, all applicable Division 01 Sections, and all applicable Division Sections; apply to this Section.

B. Section 00700 – General Requirements:
   1. Article 2, paragraph 2.07.B.1 – Preliminary Project Schedule.
   2. Article 2, paragraph 2.07.B.2 – Preliminary Schedule of Shop Drawings.
   3. Article 2, paragraph 2.08.A – Acceptable Schedule.
   4. Article 2, paragraph 2.08.B – Project Baseline Schedule.
   5. Article 6, paragraph 6.04 – Progress Schedule.
   6. Article 6, paragraph 6.05 – Recovery Schedule.

C. Section 01000 – General Project Requirements.

D. Section 01015 – Specific Project Requirements.

E. Section 01322 – Photographic Documentation.

1.04 CODES AND STANDARDS

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

B. American Association of Cost Engineers (AACE):
   1. Comply with recommended practices.

1.05 SUBMITTALS

A. Scheduler Qualifications – For firms and persons preparing schedules, submit qualifications as required by Table 1 to demonstrate their capabilities and experience. Include lists of completed projects with the following information:
   1. Project name.
   2. Project location.
   3. Name and address of engineer, architect or contractor for which schedules were prepared.
   4. Name and address of client.
   5. Other information and pertinent.

B. Preliminary Schedule of Shop Drawings – Arrange the following information in a tabular format:
   1. Scheduled date for each first submittal.
   2. Specification Section number and title.
   3. Submittal category (action or informational).
   4. Name of subcontractor.
   5. Description of the Work covered.
   6. Scheduled date for City's final approval.

C. Standard Schedule Format – Layout for all schedules and reports shall follow the standard format in the following order, activity ID, activity name, original duration, remaining duration, percent complete, start, finish, late start, late finish, total float, baseline variance, predecessor, successor, and resource ID.

D. Preliminary Project Schedule – Submit in native electronic format and *PDF format. PDF sheet size shall sufficiently large enough to legibly show entire schedule for entire construction period.

E. Baseline Project Schedule – Submit in native electronic format and *PDF format. PDF sheet size shall sufficiently large enough to legibly show entire schedule for entire construction period.

F. Progress Schedules – Submit in native electronic format and *PDF format. PDF sheet size shall sufficiently large enough to legibly show entire schedule for entire construction period.

G. CPM Reports – Submit concurrent with Preliminary, Baseline, and Progress Schedules.

H. Activity Report – Submit concurrent with each Progress Schedule a list of all activities sorted by activity number and early start date, or actual start date, if known.

I. Logic Report – Submit concurrent with each Progress Schedule a list of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.

J. Total Float Report – Submit concurrent with each Progress Schedule a list of all activities sorted in ascending order of total float.

K. Daily Labor Force Reports – Submit concurrent with each Progress Schedule.

L. Material Location Reports – Submit concurrent with each Progress Schedule.

M. Field Conditions Reports – Submit concurrent with each Progress Schedule.

N. Special Reports – Submit special reports within one day of an occurrence.

O. Daily Construction Reports – Submit at weekly intervals.

1.06 DEFINITIONS

A. Activity:
   1. A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
   2. Critical activities are activities on the critical path. They must start and finish on the planned start and finish times.
   3. Predecessor activity is an activity that must start or complete before a given activity can be started. No negative lag is allowed.
   4. Successor activity is an activity that can not start until the predecessor activity allows it. No negative lag is allowed.

B. CPM (Critical Path Method) – A schedule network analysis technique used to determine the amount of scheduling flexibility (the amount of float) on various logical network paths in the project schedule network, and to determine the minimum total project duration. Start and finish dates are calculated by means of a forward pass, using a specified start date. Late start and finish dates are calculated by means of a backward pass, starting from a specified completion date, which sometimes is the project early finish date determined during the forward pass.

C. Critical Path – Generally, but not always, the sequence of schedule activities determining the duration of the project. Generally, it is the longest path through the project. However, a critical path can end, as an example, on a schedule milestone that is in the middle of the schedule model and that has a finish-on-or-before imposed date schedule constraint.

D. Event – The starting or ending point of an activity.

E. Float – The measure of leeway in starting and completing an activity. Float time is not for the exclusive use or benefit of either City or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the following activity. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

F. Fragnet – A partial or fragmentary network that breaks down activities into smaller activities for greater detail.

G. Gantt Chart – A graphic display of schedule-related information. In the typical Gantt chart, schedule activities or work breakdown structure components are listed down the left side of the chart, dates are shown across the top and activity durations are shown as date-placed horizontal bars. Also known as a Bar chart.

H. Lag – An offset or delay from an activity to its successor. It is based on the calendar of the successor activity.

I. Major Area – A significant construction element.

J. Major Procurement – As discussed in Section 00700, paragraph 2.07.B.1, Major Procurement shall further defined as any materials that fall within the critical path and/or have a lead time of 30 days or greater.

K. Milestone – A key or critical point in time for reference or measurement.

L. Network Diagram – A graphic diagram of a network schedule, showing activities and activity relationships.

M. Schedule Level – A project team specified rule for the relative granularity of schedule activities in an overall schedule model. Following are the descriptions and levels of detail for each schedule level:

1. Level 1 - Project Summary Schedule – This is a summary level schedule that highlights major project activities, milestones and key deliverables.
2. Level 2 - Project Phase Summary Schedule – This is a more extensive summary level schedule that includes all information from the Level 1 schedule and breaks down the project into major components by area or phase.
3. Level 3 - Detail Schedule – This level will show detail plans to accomplish. Procurement, Construction, Testing and Start-up. Such schedules will have logical relationships integrated between the activities and organized in such a manner to create a Critical Path and facilitate critical path analysis. It will include all milestones and major elements and will be used to support monthly progress reporting.
4. Level 4 - Detailed Schedule by Work Package – This level will include detailed information by each work package and display all activities to be accomplished by the workforce with durations of 7 or more calendar days.
5. Level 5 - Detailed Schedule by Task – This level of detail will support the short-term planning for the field, normally for those activities of less than 1-week duration. It is used for workforce supervisors to plan and coordinate work at the detail level.

N. WBS (Work Breakdown Structure) – A deliverable-oriented hierarchical decomposition of the work to be executed by the project team to accomplish the project objectives and create the required deliverables. It organizes and defines the total scope of the project. Each descending level represents an increasingly detailed definition of the project work. The WBS is decomposed into work packages. The deliverable orientation of the hierarchy includes both internal and external deliverables. See also Schedule Levels.

O. Work Package – A deliverable or project work component at the lowest level of each branch of the WBS. The work package includes the schedule activities and schedule milestones required to complete the work package deliverable or project work component.

P. Schedule of Monthly Payments – Estimated monthly progress payments based on Baseline Schedule and Schedule of Values for each Month for the duration of the project.

1.07 COORDINATION

A. Coordinate preparation and processing of schedules and reports with performance of construction activities including the scheduling and reporting of separate Contractors performing construction activities related to project.

B. Coordinate Progress Schedules with the Schedule of Values, to estimate a Schedule of Monthly Payments, list of subcontractors, Preliminary Schedule of Shop Drawings and Samples, progress reports, Application for Payment, and other required schedules and reports.

C. Secure time commitments for performing critical elements of the Work from parties involved. Time commitments should be captured within the schedule.

1.08 SCHEDULE LEVEL

A. The Schedule Level (see paragraph 1.06M) to be used for this project shall be as specified in Section 01015 – Specific Project Requirements.

B. If a Recovery Schedule is deemed necessary by the City in accordance with Section 00700 – General Conditions, it shall be developed as a Schedule Level 5 regardless of the requirements listed in Section 01015 – Specific Project Requirements.

1.09 SCHEDULING SOFTWARE

A. Prepare schedules using the latest version of Primavera version P6 or higher or Microsoft Project. See Section 01015 – Specific Project for additional or specific software requirements.

1.10 PRELIMINARY SCHEDULE OF SHOP DRAWINGS AND SAMPLES

A. Preparation – Provide a schedule of submittals arranged in chronological order by date required by the construction schedule. Include time required for review, resubmittal, ordering, manufacturing, fabrication, and delivery as set forth in the Contract Documents, when establishing dates.
B. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, the estimated Schedule of Monthly Payments, and Progress Schedules.
C. Include Shop Drawing and Sample Submittals required during the first 60 days of construction. List those required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
D. At Contractor's option, show submittals on the Preliminary Progress Schedule, instead of tabulating them separately.

1.11 SCHEDULE REQUIREMENTS

A. Requirements According to Schedule Level – Contractor shall provide the following information based in the Schedule Level defined in Section 01015 – Specific Project Requirements. An "X" indicates that the requirement is applicable to the Schedule Level.

Table 1. Schedule Requirements

Item	Requirement	Schedule Level				
		1	2	3	4	5
Procedures	Comply with procedures contained the American Association of Cost Engineers (AACE) recommended practices.	X	X	X	X	X
Time Frame	Extend project schedule from date established for the Notice to Proceed to the date of Final Completion.	X	X	X	X	X
Contract Times	Contract Times shall not be changed unless specifically authorized by Change Order.	X	X	X	X	X
Activities	Treat separate major areas as a separate numbered activity for each principal element of the Work. (WBS)	X	X	X	X	X
Activity Duration	Define activities so none is longer than 20 days, unless specifically allowed by City	X	X	X	X	X
Milestones	Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and Final Completion.	X	X	X	X	X

Table 1. Schedule Requirements

Item	Requirement	Schedule Level				
		1	2	3	4	5
Computer Software	Prepare schedules using the latest version of Primavera version P6 or higher or Microsoft Project. Refer to Section 01015 for project specific requirements.		X	X	X	X
Scheduler's Qualifications	Submit scheduler's qualifications for review and approval			X	X	X
Submittal Review Time	Include review and re-submittal times for review of Shop Drawings and Samples. Each item listed in the Preliminary Schedule of Shop Drawings and Samples shall be included in the schedule.			X	X	X
Procurement Activities	Include separate activities for the procurement process of long-lead and major items that require a cycle of more than 30 days or fall within the critical path. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.			X	X	X
Startup and Testing Time	Include not less than two days for startup and testing.			X	X	X
Constraints	Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.		X	X	X	X
Phasing	Arrange list of activities on schedule by phase.		X	X	X	X
Work by City	Include a separate activity for each area of the Work performed by City.		X	X	X	X
Products Ordered in Advance	Include a separate activity for each product. Delivery dates indicated stipulate the earliest possible delivery date.		X	X	X	X
City-Furnished Products	Include a separate activity for each product. Delivery dates indicated stipulate the earliest possible delivery date.		X	X	X	X
Work Restrictions	Show the effect of the following items on the schedule: • Coordination with existing construction. • Limitations of continued occupancies. • Uninterruptible services. • Partial utilization before Substantial Completion. • Use of premises restrictions. • Provisions for future construction. • Seasonal variations. • Environmental control.			X	X	X
Work Stages	Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following: • Subcontract awards. • Submittals. • Purchases. • Fabrication. • Sample testing. • Deliveries. • Installation. • Tests and inspections.			X	X	X

Table 1. Schedule Requirements

Item	Requirement	Schedule Level				
		1	2	3	4	5
	• Adjusting. • Curing. • Startup and placement into final use.					
Area Separations	Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities: • Contractor Mobilization* • Procurement – Divided by Long Lead and Short Lead • Completion of civil work • Completion of structural work • Completion of mechanical installation • Completion of electrical installation • Partial Utilization • Substantial Completion* • Achievement of Full Operations* • Punch List and Final Corrections* • Final Completion* *Required element, all others to be used as applicable based on project scope.			X	X	X
Contract Modifications	For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using fragments to demonstrate the effect of the proposed change on the overall project schedule.		X	X	X	X
Work under More than One Contract or Subcontract.	Include a separate activity for each contract or subcontract.			X	X	X
Detailed by Work Package	Include detailed information by each work package and display all activities to be accomplished by the workforce with durations of 7 or more calendar days				X	X
Detail by Task	Include detail by task to support the short-term planning for the field, normally for those activities of less than 1-week duration.					X

B. Cost Correlation:
   1. Requirement to provide a Cost Correlation shall be as indicated in Section 01015 – Specific Project Requirements.
   2. At the head of schedule, provide a cost correlation line, indicating planned and actual costs. On the line, show dollar volume of the Work performed as of dates used for preparation of payment requests.

1.12 PRELIMINARY AND BASELINE PROJECT SCHEDULES

A. Indicate each significant construction activity separately. Identify each Monday of each week with a continuous vertical line. Outline significant construction activities for the first 60 days of construction. Include skeleton diagram for the remainder of the Work.

B. Preliminary Network Diagram – Outline significant construction activities for the project. To be submitted with the Preliminary Progress Schedule.

1.13 PROGRESS SCHEDULES

A. General – Prepare Progress Schedules using a CPM network analysis diagram.

B. CPM Schedule Preparation – Prepare a list of all activities required to complete the Work. Using the preliminary network diagram, prepare a skeleton network to identify probable critical paths:

1. Activities – Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:
   (a) Preparation and processing of submittals.
   (b) Purchase of materials.
   (c) Delivery of materials and equipment.
   (d) Fabrication.
   (e) Installation.
2. Processing – Process data to produce output data or a computer-drawn, time scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
3. Format – Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges:
   (a) Sub-networks on separate sheets are permissible for activities clearly off the critical path. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 30 days after date established for the Notice to Proceed.
   (b) Establish procedures for monitoring and updating CPM schedule and for reporting progress monthly. Coordinate procedures with progress meeting and payment request dates.
   (c) Use "one calendar day" as the unit of time.
4. Initial Issue of Schedule – Prepare initial network diagram from a list of straight "early start-total float" sort. Identify critical activities. Prepare tabulated reports showing the following:
   (a) Contractor or subcontractor and the Work or activity.
   (b) Description of activity.
   (c) Principle events of activity.
   (d) Immediate preceding and succeeding activities.
   (e) Early and late start dates.
   (f) Early and late 'finish dates.
   (g) Activity duration in days.
   (h) Total float or slack time.
   (i) Average size of workforce.
5. Schedule Updating – Concurrent with making revisions to schedule, prepare tabulated reports showing the following:
   (a) Identification of activities that have changed added or deleted.
   (b) Changes in logic ties.
   (c) Changes in early and late start dates.
   (d) Changes in early and late finish dates.
   (e) Changes in activity durations in days.
   (f) Changes in the critical path.
   (g) Changes in total float or slack time.
   (h) Changes in the Contract Time.

6. Value Summaries – Prepare two cumulative value lists, sorted by finish dates:
   (a) In first list, tabulate activity number, early finish date, dollar value, and cumulative dollar value.
   (b) In second list, tabulate activity number, late finish date, dollar value, and cumulative dollar value.
   (c) In subsequent issues of both lists, substitute actual finish dates for activities completed as of last date.
   (d) Prepare list for ease of comparison with payment requests; coordinate timing with progress meetings.
   (e) In both value summary lists, tabulate "actual percent complete" and "cumulative value completed" with total at bottom.
   (f) Submit value summary printouts one week before each regularly scheduled progress meeting.

C. Reports:
   1. Daily Labor Force Reports – Prepare a daily labor force report recording the following information concerning events at Project site:
      (a) List of subcontractors at Project site.
      (b) List of separate contractors at Project site.
      (c) List of all the Contractor's and subcontractor's personnel showing hours worked in labor class at Project site.
   2. Material Location Reports – At monthly intervals, prepare a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site.
   3. Field Condition Reports – Immediately on discovery of a difference between field conditions and the Contract Documents, prepare a detailed report. Submit electronically and directly to City with a request for information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

D. Special Reports:
   1. General – Submit special reports within one day of an occurrence.
   2. Reporting Unusual Events – When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events; persons participating; response by Contractor’s personnel; evaluation of results or effects; and similar pertinent information. Advise City in advance when these events are known or predictable.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

3.01 PROGRESS SCHEDULES

A. Updates – At monthly intervals, update schedule to reflect actual construction progress and activities. Progress Schedule should be provided for review and approval prior to monthly pay request. Progress Schedules will be reviewed and discussed at regularly schedule progress meetings. Contractor shall bring printed copies of CPM Schedule:

1. Revise schedule immediately after an activity revision has been recognized or made at the direction by the City. Issue updated schedule concurrently with the report of each such progress meeting.
2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
3. As the Work progresses, indicate actual completion percentage for each activity.
4. Post copies in Project meeting rooms and temporary field offices.

END OF SECTION

CITY OF FOUNTAINS
HEART OF THE NATION

KANSAS CITY
MISSOURI

DAILY FIELD OBSERVATION REPORT

Project Number _____

Project Title _____

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 Number _____

Project Title _____

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 Number _____

Project Title _____

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

SECTION 01322 – PHOTOGRAPHIC AND VIDEO DOCUMENTATION

PART 1 - GENERAL

1.01 SUMMARY

A. This Section outlines the requirements for photographic and video documentation. The Contractor is solely responsible for the development of an overall plan to fully document Site conditions and the progress of the Work.

B. The Contractor shall hire a professional photographer to provide the services and deliverables described herein.

C. This section does not include work associated with internal closed-circuit television (CCTV) inspections of sewer gravity pipes. See Section 02686 – CCTV Inspection of Sewer Mains.

1.02 SPECIFICATION MODIFICATIONS

A. It is understood that throughout this section these Specifications may be modified by appropriate items in Section 01015 – Specific Project Requirements or as otherwise indicated in the contract documents.

1.03 RELATED SECTIONS

A. Section 00700 – General Conditions.

B. Section 01015 – Specific Project Requirements.

C. Section 01300 – Submittals.

D. Section 01320 – Construction Progress Documentation.

E. Section 01335 – Document Management.

F. Section 02686 – CCTV Inspection of Sewer Mains.

1.04 DEFINITIONS

A. Pre-Construction Video: A video taken to document Site conditions prior to the start of construction.

B. Pre-Construction Photographs: Photographs taken to document Site conditions prior to the start of construction. All Pre-Construction Photographs shall be digital, indexed on an interactive map and shown on a View Location Map.

C. Construction Progress Photographs: Digital photographs taken to document the progress of construction.

D. Construction Activity Photographs: Digital photographs taken to document specific construction activities.

E. Post-Construction Photographs: Digital photographs taken after final restoration to document the finished condition of the Site.

F. Affidavit of Authenticity: The photographer's signed and notarized affidavit, attesting to the production of the original photographs, videos and their authenticity.

1.05 SUBMITTALS

A. Submit as specified in Section 01300 – Submittals.

B. Other required Submittals:

1. Photographer's Qualifications: Submit for review and approval the qualification information demonstrating the photographer meets the requirements of paragraph 1.06 of this Section.
2. Phasing Plan: If applicable, submit for review and approval a phasing plan for Pre-Construction Photographs and Videos.

3. Pre-Construction Photographs: Submit for review and approval digital pre-construction photographs with an interactive index map, Photograph Navigation System (see paragraph 2.05 of this Section) and affidavit of authenticity.
4. Pre-Construction Video: Submit for review and approval a pre-construction video with a Video Navigation System (see paragraph 2.05 of this Section) and affidavit of authenticity (see paragraph 1.04 of this Section).
5. Construction Progress Photographs: On a monthly basis, submit digital construction photographs, interactive index map and affidavit of authenticity.
6. Construction Activity Photographs: On a monthly basis, submit digital activity photographs (if different than progress photographs), interactive index map and affidavit of authenticity.
7. Post-Construction Photographs/Video: Submit for review and approval digital post-construction photographs or video, interactive index map and affidavit of authenticity.

1.06 QUALITY ASSURANCE

A. The Contractor is responsible for the quality assurance and quality control of the Work.
B. General Quality: Photographs and video shall be clear and of sufficient quality to show relevant detail. They shall not be blurred, taken in shadow or too far away to provide conclusive information. The City may require that the photographs or video be retaken should the quality be insufficient. Costs for such re-takes are the Contractor's sole responsibility and shall be done at no extra cost to the City.
C. Qualifications of Photographer: The Contractor shall engage the services of a professional photographer with a minimum of 3 years of experience in construction photography to document the conditions of the project site. Upon request, samples of the photographer's prior work and/or references shall be submitted.
D. Affidavit of Authenticity: The Contractor shall provide the photographer's signed and notarized affidavit, attesting to the production of the original photographs, videos and their authenticity. An affidavit of authenticity shall be provided with each submittal/deliverable.

1.07 MINIMUM REQUIREMENTS

A. The section specifies several different sets of photographic and video documentation requirements. The extent of documentation will depend upon the size and type of the project. The following table summarizes the basic documentation requirements.

Table 1. Summary of Requirements

Set of Documentation	Mandatory	As Required by Section 01015
Pre-Construction Video		✓
Haul Route Video		✓
Pre-Construction Photographs	✓	
Interactive Index Map		✓
Construction Progress/Activity Photographs		✓
Post-Construction Photographs/Video		✓

1.08 OWNERSHIP

A. The photographs and videos shall become the sole property of the City.

1.09 SCHEDULES

A. Schedule of Values: Photographic/Video documentation shall be listed as one line item in the Schedule of Values.
B. Construction Progress Documentation: Each set of photographs or videos shall be listed in the Preliminary Project Schedule as a discrete activity. See Section 01320 – Construction Progress Documentation.

1.10 PHASING

A. Based on the nature and scope of the Work, the Contractor may phase the Pre-Construction Photographs and Video. If phasing is to be implemented, the following shall apply:
   1. The Contractor shall submit a Phasing Plan that identifies each area of the Work.
   2. For each phase, Pre-Construction Photographs and Videos shall be taken within 21 days of the start of construction activities unless otherwise approved in writing by the City/Design Professional.
B. Under no circumstances shall construction begin in any area until the Pre-Construction Photographs and/or Video have been submitted and approved by the City/Design Professional.

PART 2 - PRODUCTS

2.01 PHOTOGRAPH QUALITY

A. Photographic images shall be captured in digital format, with a minimum of 10-megapixel resolution and taken without JPG compression.
B. Each photograph shall include a date/time stamp in the image, showing when the image was taken.

2.02 VIDEO QUALITY

A. All video recordings shall be captured in full 1080-dpi Hi-Definition digital format, without compression or file-reduction whether applied in-camera or after capture during editing.
B. The original video segments shall be retained in the format captured in camera (such as MP4 or MTS for Canon HD Video) without compression or modification that would reduce resolution or quality. The video shall include a date/time stamp in the image, showing when the image was taken. Video shall include verbal description and narrative of what is being captured.

2.03 METADATA

A. Digital files for photographs and videos shall, at a minimum, contain the following metadata:
   1. Project Name.
   2. Date and Time Taken.
   3. All other metadata inherently provided by the camera/video equipment.

2.04 MEDIA LOG

A. The Contractor shall maintain a media log (photographs and videos) for the project. The log shall include, but is not limited to, the following information for each photograph and/or video:
   1. Project Name.
   2. Project Number.
   3. Contract Number.
   4. Name of City and Department.

5. Name of Contractor.
6. Name of Design Professional.
7. Photograph file name (the specific format should be tied to the project name). Photograph file name shall be unique to each digital file and shall be embedded in the digital image in a manner that is permanent and clearly legible when the file is opened.
8. Include a date designator in file names.
9. Date the photograph was taken.
10. The name of the photographer who took the photograph.

2.05 PHOTOGRAPH AND VIDEO NAVIGATION SYSTEM

A. If specified in Section 01015 – Specific Project Requirements, the Contractor shall provide an electronic photographic and video navigation system (navigation system) for searching and viewing recorded imagery.

B. Interactive Index Map: The navigation system shall indicate the general location of each area photographed or video recorded using icons and other suitable mark-ups on the actual construction drawings in PDF-format.

C. The navigation system shall utilize standard PDF-reader software (such as Adobe Reader, Acrobat, or Bluebeam Vu) or other software that shall be included with the deliverables. Icons shall be individually hyperlinked to the respective photograph, video, affidavit of authenticity and media log file for immediate playback in Windows Media Player, VLC or other players.

D. The navigation system shall include the following:
1. Project Name.
2. Project Number.
3. Contract Number.
4. Name of City.
5. Name of Contractor.
6. Name of Design Professional.
7. Ranges of dates for which the photographs or videos were taken.
8. The name of the photographer.
9. Affidavit of Authenticity.
10. Media Log.
11. Photographs.
12. Videos.

E. A navigation system shall be provided for each set of photographs and videos taken.

PART 3 - EXECUTION

3.01 PRIOR TO PHOTOGRAPHIC AND VIDEO DOCUMENTATION

A. Construction Limits: Prior to the Pre-Construction Photographs and Video, the Contractor shall flag or mark the construction limits and excavation areas for identification, and project centerlines shall be physically marked with survey stakes and/or high visibility paint (including station numbers).

B. Mark Utilities: Prior to the Pre-Construction Photographs or Video, the Contractor shall notify utilities and have them marked so that utility locations are documented.

C. Coordinate with City: For any work that requires a representative of the City to be present, the Contractor shall provide the City a minimum of 2 days' notice.

3.02 PRE-CONSTRUCTION VIDEO

A. If specified in Section 01015 – Specific Project Requirements, the Contractor shall provide a pre-construction video.

B. Scope: Prior to the start of construction, the Contractor shall prepare a color video recording with audio of all the areas to be affected by construction. All pre-construction video recordings shall have sufficient detail to reveal the condition (including defects and damage) of all existing features, such as pavement, driveways, culverts, inlets, sidewalks, landscaping, vegetation, creek banks, trees, structures, foundations and other such items along the construction route and in the immediate adjacent areas, which might be affected by the construction operations. In addition, the videographer shall move beyond the construction zone as needed to ensure documentation of features and areas that may not be adequately recorded from the centerline rotations. Videos shall be taken on both sides of the street when construction is in or along a roadway (use this approach along drainage channels and in other similar situations).

C. Schedule: Taken after utilities have been marked and prior to the placement of materials or equipment on the Site. Videos shall be submitted to the City for review and approval. Under no circumstances shall construction begin until the pre-construction video has been submitted and approved.

D. The pre-construction video recording shall be done in the presence of a representative of the City.

E. The Contractor shall document all pre-existing site conditions/elements of the Site, the same as listed for the Pre-construction Photographs.

F. The video documentation shall provide a clear and continuous view of the project showing all visible utilities and features within the limits of construction.

G. To preclude the possibility of tampering or editing in any manner, all video recordings shall, by electronic means, generate and display continuously and simultaneously on the screen or in the video file metadata properties digital information to include the date and time of recording. The time information shall consist of hours, minutes and seconds, separated by colons (i.e., 10:35:18).

H. The audio/video recording shall consist of one video and one audio track which shall be recorded simultaneously. All tracks shall consist of the original live recordings and thus shall not be copies of other audio or video recordings.

I. The audio track shall contain the narrative commentary. Ample descriptive narrative shall be recorded simultaneously during all recordings. Narration shall include clearly audible comments that will deliver station number and/or street address, locations, direction of view and rotation.

J. Typical video segments should not exceed 10 minutes in length.

K. Rotations of 360-degrees shall be at the beginning and end of each video segment and at each 100 foot increment throughout the video.

L. The rate of speed in the general direction of travel of the conveyance used during recording shall be controlled to provide a usable image. On average, the rate of forward travel during videotaping shall not be less than fifteen minutes for every 1000 linear feet of pipeline route or street centerline; slower rates shall be utilized in residential/commercial areas.

M. Panning rate, zoom-in rate and zoom-out rate shall be controlled sufficiently such that playback will provide clarity of the object viewed.

N. All recording shall be done during times of good visibility. No recording shall be done during periods of precipitation unless authorized by the City.

3.03 HAUL ROUTE VIDEO

A. If specified in Section 01015 – Specific Project Requirements, the Contractor shall provide pre-construction video documentation of all haul routes associated with the Project.
B. Haul route videos shall be made at the time of the Pre-Construction Photographs.
C. Haul Route Videos shall meet the requirements of the paragraph PRE-CONSTRUCTION VIDEO as well as the following:
    1. Haul routes shall be recorded during daylight hours and during good weather conditions.
    2. Video equipment may be mounted on a vehicle. The speed of the vehicle while recording shall not be more than 5 miles per hour (mph). If traffic or safety concerns prohibit driving 5 mph then the video shall be taken while walking the route.
    3. No audio/narrative commentary is required for the haul route video.

3.04 PRE-CONSTRUCTION PHOTOGRAPHS

A. The Contractor shall provide pre-construction photographs as specified in this Section and as specified in Section 01015 – Specific Project Requirements.
B. Scope: The purpose for pre-construction photo documentation is to record existing conditions, damage and features on or adjacent to the project site. The principal reason for obtaining photographs is so that items such as cracked curbs, broken pavement, sidewalks, plugged culverts, driveway conditions, lawn conditions and other existing conditions located in the Project Site may be clearly shown and documented. This will to some degree mitigate the possibility of post-construction restoration issues with property owners in the Project area.
C. Schedule: Take photographs after utilities have been marked, prior to placement of materials or equipment on the Site and prior to the start of construction activities in an area. Photographs shall be submitted to the City for review and approval. Under no circumstances shall construction begin until the pre-construction photographs have been submitted and approved.
D. Pre-construction photographs shall be taken at sufficient intervals to be able to carefully document the pre-construction conditions of the Site and in no case more than 50-foot intervals along the street, right-of-way, drainage easement and water/wastewater line route before commencement of the Work.
E. In addition, select photographs shall be taken as needed along the construction limits, and of adjacent properties, to ensure documentation of features and areas that may not be adequately recorded in the centerline rotations. Photographs shall be taken along both sides of the street when construction is in or along a roadway.
F. Overlapping composition techniques shall be employed to ensure maximum photographic coverage.
G. Pre-construction photographs shall be taken after the utility locations have been marked.
H. Pre-construction photographs shall be taken with a representative of the City present unless otherwise authorized by the City.
I. All Pre-Construction Photographs shall have sufficient detail to reveal the condition (including defects and damage) of all existing features, such as pavement, driveways, culverts, inlets, sidewalks, landscaping, vegetation, creek banks, trees, structures, foundations and other such items along the construction route, and adjacent areas which might be affected by the construction operations. An identifier such as house or business address/signs, property numbers, mail boxes, landscaping, etc… shall be included when practical in each view for ease of identification.
J. At a minimum, pre-construction photographs must be taken of the following views:
    1. The entire street right of way and limits of construction; whichever is greater.
    2. The entire easement width and length (both permanent and temporary).

3. All curb lines (both sides of street) – all pre-existing curb damage not called for replacement within the Work and shall include major cracks.
4. All driveways, steps, and curbs and curb ramps (both sides of street).
5. Fence and gate conditions.
6. Trees, ornamental shrubs, plantings/planter boxes and evidence of irrigation features.
7. Other privately or publicly owned features or facilities that might be disturbed by the construction.
8. Views of structures, both inside and adjacent to the project site and easements in areas where the Contractor will be working within five (5) feet of said structure.
9. Prominent utility features, such as: guy wires, poles, signs, valves, fire hydrants, meters, pull boxes, etc.
10. Streams and stream banks within the limits of construction.
11. At the discretion of the Contractor, photograph offsite roadways that will be subjected to heavy usage such as for haul routes or delivery of heavy components or equipment. Refer to Paragraph HAUL ROAD VIDEO for additional requirements.
12. Other significant or prominent features to protect the City and the Contractor following construction (e.g. close-up photographs of pre-existing broken curbs, cracked/failed pavement, damaged adjacent retaining walls, etc.).
13. Views of structures, both inside and adjacent to the ROW/easement in areas where the Contractor will be working within five (5) feet of said structure.
14. Other views as requested by the City.

3.05 CONSTRUCTION PROGRESS PHOTOGRAPHS

A. If specified in Section 01015 – Specific Project Requirements, the Contractor shall provide Construction Progress Photographs.
B. Scope: The Contractor shall provide construction progress photographs to depict the progress of the work. The Contractor shall be responsible for photographs of the Site to show the existing and general progress of the Work. The City will advise as to which views are of interest.
C. Schedule: Photographs shall be taken at the time of the Pre-construction Photographs, a minimum of once per month throughout the duration of the Project, and at the time of the Post Construction Photographs. Construction Progress Photographs are to be submitted each month with the Contractor's Application for Payment. Applications for Payment was not be considered acceptable until the photographs are provided.
D. This set of photographs will be taken as close as possible to the same locations and views of the pre-construction photography.

3.06 CONSTRUCTION ACTIVITY PHOTOGRAPHS

A. If specified in Section 01015 – Specific Project Requirements, the Contractor shall provide Construction Activity Photographs.
B. Scope: The Contractor shall provide photographs taken to document Site conditions and specific construction activities throughout the duration of the Project.
C. Schedule: Photographs shall be taken two times per month (every two weeks) for the duration of the Project.
D. Construction Activity Photographs are to be submitted each month with the Contractor's Application for Payment.
E. Photographs shall be taken to depict the work accomplished during the month. These photographs are to include, but are not limited to, the following:
    1. Work not yet covered up.
    2. When mechanical, electrical, plumbing or building inspections are scheduled.

3. The beginning of installation of major items of equipment.
4. After installation of major items of equipment.
5. Other significant construction activities.
6. As directed by the City.

3.07 POST-CONSTRUCTION PHOTOGRAPHS

A. If specified in Section 01015 – Specific Project Requirements, the Contractor shall provide Post-Construction Photographs.

B. Scope: The Contractor shall provide Post-Construction Photographs of the project area that documents the final restoration and construction improvements. Post-Construction photographs shall show the general condition of the construction zone (recording finished landscape and other restoration, plus construction improvements), and other areas that may have been affected by construction activities.

C. Schedule
   1. Photographs shall be taken after completion of the Substantial Completion punch list when the project is complete, the Site is restored to the satisfaction of the City, and before submission of the Application for Final Payment.
   2. Post-construction photographs shall be taken after all items have been address from the Substantial Completion inspection, after cleanup and site restoration, and before application for final payment.

D. Post-Construction Photographs are to be submitted with the Contractor's Application for Final Payment.

E. The Contractor shall coordinate the schedule of the post-construction photographs with the City's Project Manager and shall provide at least 5 days written notice to allow the City's Representative to be present when the photographs are taken.

3.08 POST-CONSTRUCTION VIDEO

A. If specified in Section 01015 – Specific Project Requirements, the Contractor shall provide a Post-Construction Video.

B. Scope: The Contractor shall prepare a color video recording with audio of all the areas affected by construction. All Post-Construction video recordings shall have sufficient detail to reveal the final, restored condition of all existing features, such as pavement, driveways, culverts, inlets, sidewalks, landscaping, vegetation, creek banks, trees, structures, foundations, and other such items along the construction route, and in the immediate adjacent areas, which might have been affected by the construction operations. In addition, videographer shall move beyond the construction zone as needed to insure documentation of features and areas that may not be adequately recorded from the centerline rotations. Videos shall be taken on both sides of the street when construction is in or along a roadway (use this approach along drainage channels and in other similar situations).

C. Schedule: The post-construction video shall be taken in conjunction with the post-construction photographs.

D. Post-construction videos are to be submitted with the Contractor's Application for Final Payment.

E. Unless otherwise authorized by the City, the post-construction video recording shall be done with a representative of the City present.

F. The Contractor shall document all post-construction site conditions/elements of the Site as listed for the post-construction Photographs.

G. The video documentation shall provide a clear and continuous view of the project alignment showing all visible utilities and features within the limits of construction.

H. To preclude the possibility of tampering or editing in any manner, all video recordings shall, by electronic means, generate and display continuously and simultaneously on the screen digital information to include the date and time of recording. The time information shall consist of hours, minutes and seconds, separated by colons (i.e., 10:35:18).
I. The audio video recording shall consist of one video and one audio track which shall be recorded simultaneously. All tracks shall consist of original live recordings and thus shall not be copies of other audio and video recordings.
J. The audio track shall contain the narrative commentary. Ample descriptive narrative shall be recorded simultaneously during all recordings. Narration shall include clearly audible comments that will deliver station number and/or street address locations, direction of view and rotation.
K. Typical video segments should not exceed 10 minutes in length.

3.09 DELIVERABLES

A. Refer to Section 01015 – Specific Project Requirements for additional deliverables required for the Project.
B. Delivery of the documentation record shall be made as soon as is practical after the images are recorded. Deliverables include original photographs in JPG format, photographs converted to pdf format, interactive map index and navigation system.
C. Electronic Storage Devices: Submit the navigation system on a non-returnable USB compatible flash drive. Submittals shall conform to the following:
    1. Submit with the monthly invoice two sets of digital photographs and/or videos. Each set shall be contained on a separate electronic storage device.
    2. Each set shall be cumulative of all photographs and/or videos taken to date.
    3. Affidavit(s) of Authenticity shall be included in a digital format.
D. Document Management System: Unless otherwise noted in Section 01015 – Specific Project Requirements, all deliverables shall be provided in an electronic format using the specified document management system and in accordance with paragraph 1.05 of this Section.

END OF SECTION

CITY OF FOUNTAINS
HEART OF THE NATION

KANSAS CITY
MISSOURI

TRANSMITTAL LETTER

Project Number _____

Project Title _____

TO: _____

ATTN: _____

Date _____

Re: _____

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

SECTION 01335 –DOCUMENT MANAGEMENT

PART 1 - GENERAL

1.01 SUMMARY

A. An internet-based coordination and document management system (DMS) will be used for the Project. This system will be used to manage project documentation among the City, Contractor and Design Professional. The Contractor shall utilize the document management system for all project related correspondence and documentation.

B. The DMS will be utilized to create, track and organize all project documentation, including, but not limited to, the following:

1. Schedules.
2. Applications for Payment.
3. Meeting minutes with action items.
4. Project correspondence.
5. Shop Drawing and Sample(s) Submittals.
6. Transmittals.
7. Change Management:
   (a) Requests for Interpretation.
   (b) Requests for Proposal.
   (c) Work Change Directives.
   (d) Change Orders.
8. Reporting:
   (a) Certified Payroll Report.
   (b) Subcontractors and Major Material Suppliers List.
   (c) Daily Labor Force Reports.
   (d) Daily Inspection Reports.
   (e) Photographs and Video.
   (f) Certificate of Achievement of Full Operation.
   (g) Contractor Affidavit for Final Payment.
   (h) Subcontractor Affidavit for Final Payment.
   (i) Punch Lists.
9. Notifications:
   (a) Correction of Defective Work.
   (b) Notification of Non-Compliance.

1.02 RELATED SECTIONS

A. Section 00700 – General Conditions.
B. Section 01015 – Specific Project Requirements.
C. Section 01300 – Submittals.

1.03 COORDINATION MEETING

A. Prior to the pre-construction conference, the City will facilitate a meeting with the Contractor to review requirements for project coordination, document control and use of the DMS. The meeting should be scheduled to allow the Contractor time to submit the initial project correspondence and preliminary schedules in accordance with Section 00700-General Conditions.

B. At this meeting, the City will present the procedures to be used for document management for the Project.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

Not used.

END OF SECTION

SECTION 01500 – TEMPORARY FACILITIES

PART 1 - GENERAL

1.01 SUMMARY

A. This specification covers the requirements for temporary construction facilities required on all projects.

1.02 SPECIFICATION MODIFICATIONS

A. It is understood that throughout this section these Specifications may be modified by appropriate items in Section 01015 – Specific Project Requirements or as otherwise indicated on the Contract Drawings.

1.03 RELATED SECTIONS

A. Section 01000 – General Project Requirements.
B. Section 01015 – Specific Project Requirements.
C. Section 01300 – Submittals.

1.04 CODES AND STANDARDS

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.
B. National Fire Protection Association:
    1. NFPA 10 - Standard for Portable Fire Extinguishers.
    2. NFPA 70 - National Electric Code.
    3. NFPA 241 - Standard for Safeguarding Construction, Alternation and Demolition Operations.

1.05 INFORMATION PROVIDED BY THE CITY

A. As provided in the Contract Documents.

1.06 SUBMITTALS

A. Submit as specified in Section 01300 – Submittals.

1.07 QUALITY ASSURANCE

A. The Contractor is responsible for the quality assurance and quality control of the Work.
B. Regulations – Comply with industry standards and applicable laws and regulations of authorities having jurisdiction, including but not limited to:
    1. Building Code requirements.
    2. Health and safety regulations.
    3. Utility company regulations.
    4. Police, Fire Department and rescue squad rules.
C. Standards:
    1. Comply with NFPA 10 and 241 and ANSI A10 Series standards “Temporary Electrical Facilities.”
    2. Comply with NEMA, NECA and UL standards and regulations for temporary electric service. Install service in compliance with NFPA 70.

D. Inspections – Arrange for authorities having jurisdiction to inspect and test each temporary utility before use. Obtain required certifications and permits.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

3.01 OFFICE

A. Stationary Office – If required in Section 01015 - Specific Project Requirements, Contractor shall maintain a suitable stationary office at or near the Site during the performance of the Work.
B. Assigned Vehicle – For projects of a certain scale and duration, the City will allow the Contractor to use an assigned vehicle to serve as a mobile office at the site of the Work. See Section 01015 – Specific Project Requirements regarding the use of a vehicle in lieu of a stationary office.
C. The office shall serve as the headquarters of the Contractor's representative authorized to receive Contract Documents, instructions, other communication or articles associated with the Work.
D. Any communication given to the Contractor's representative or delivered to Contractor's office at the site of the Work shall be deemed to have been delivered to Contractor.
E. Copies of the Contract Documents shall be kept at the office and shall be available for use at all times.

3.02 FIELD OFFICE FOR RESIDENT PROJECT REPRESENTATIVE

A. See Section 01015 – Specific Project Requirements regarding the requirement of the Contractor to provide a field office for the Resident Project Representative.

3.03 TEMPORARY UTILITIES

A. Provide temporary utilities required for construction. Materials may be new or used, must be adequate for the required usage, not create unsafe conditions and not violate applicable codes and standards.
B. Power:
    1. All power for lighting, operations of the Contractor's plant/equipment or for any other use which may be required for proper completion of the Work shall be provided by the Contractor.
    2. Temporary heat and lighting shall be maintained until the Work is accepted.
C. Telephone/internet service:
    1. Contractor shall make all necessary arrangements and pay all installation and monthly charges for telephone/internet service for the temporary office at the site and shall provide all required devices for such service.
D. Sanitary Facilities:
    1. 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.
    2. 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.

3. Ventilate the units to control odors and fumes and empty and clean them at least once a week or more often if required by the City. The doors shall be self-closing. Locate the facility behind the construction fence or out of the public view.

3.04 SECURITY

A. See Section 01000 – General Project Requirements – SECURITY regarding the requirements for security.

3.05 PARKING

A. See Section 01000 – General Project Requirements – PARKING regarding the requirements for parking.

END OF SECTION

SECTION 01550 - TRAFFIC CONTROL

PART 1 - GENERAL

1.1 SCOPE

A. This Section includes requirements for traffic control during the execution of the work.

1.2 GENERAL

A. The Contractor shall furnish all labor, superindendence, project management, materials, equipment, and incidentals as necessary to comply with these requirements.

1.3 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.

1.4 MAINTENANCE OF TRAFFIC

A. Contractor shall conduct his 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 City and tenant of private property, or from the authority having jurisdiction over public property involved, to obstruct traffic at the designated point.

B. Costs of all necessary permits for maintenance of traffic are to the account of the Contractor.

1.5 BARRICADES AND LIGHTS

A. All streets, road, highways, 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.

PART 2 - PRODUCTS – (Not Used)

PART 3 - EXECUTION – (Not Used)

End of Section

SECTION 01566 – CLEANUP OPERATIONS

PART 1 - GENERAL

1.01 SUMMARY

A. The Contractor shall provide all material, labor and equipment necessary for cleanup operations. The Contractor shall maintain a neat and clean job site at all times.

1.02 SPECIFICATION MODIFICATIONS

A. It is understood that throughout this section these Specifications may be modified by appropriate items in Section 01015 – Specific Project Requirements or as otherwise indicated on the Contract Drawings.

1.03 RELATED SECTIONS

A. Section 00700 – General Conditions.
B. Section 01000 – General Project Requirements.
C. Section 01015 – Specific Project Requirements.
D. Section 02510 – PCC Sidewalks, Driveways, Ramps.
E. Section 02930 – Seeding.
F. Section 02931 – Sodding.
G. Section 03000 – Miscellaneous Concrete.

1.04 CODES AND STANDARDS

A. Not used.

1.05 DEFINITIONS

A. Not used.

1.06 INFORMATION PROVIDED BY THE CITY

A. As provided in the Contract Documents.

1.07 SUBMITTALS

A. The Contractor shall submit as specified in Section 01300 – Submittals, if proposing alternate methods and facilities for concrete washout facilities. See paragraph 3.03.E. 3 in this Section.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 SITE MAINTENANCE

A. Cleanup operations shall be conducted in accordance with Section 00700 General Conditions, Article 6 – Contractor's Responsibilities.
B. Adequate cleanup shall be a condition for the processing of the Contractor's monthly progress payment applications.
C. 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.

D. 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.
E. Any deficiency in the quantity of material for filling depressions caused by settlement shall be supplied by the Contractor.
F. 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.
G. In addition, as directed by the City, the Contractor may be required to obtain a City approved release form, signed by the property owners affected by the Work.

3.02 DUST CONTROL

A. The Contractor shall take all reasonable measures to prevent unnecessary dust. Earth surfaces subject to dusting shall be kept moist with water or by the approved application of an approved chemical suppressant. When practical, dusty materials in piles or in transit shall be covered to prevent blowing.
B. The Contractor shall make provisions so that buildings or operating facilities that may be adversely affected 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.

3.03 CONCRETE WORK

A. See Section 02510 – PCC Sidewalks, Driveways and Handicap Access Ramps for additional requirements.
B. See Section 03000 – Miscellaneous Concrete for additional requirements.

C. 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.

D. 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. Refer to Section 02930 – Seeding and Section 02931 - Sodding for additional requirements.
   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.

E. Concrete Washout Facilities:
   1. The Contractor shall provide facilities for concrete washout to collect and retain all the concrete washout water and solids in leak proof containers.
   2. Lined wash pits or washout boxes are acceptable.
   3. 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.
   4. The location of washout facilities shall be indicated on the Construction Site Plan (See Section 01000 – General Project Requirements, paragraph CONSTRUCTION SITE PLAN).
   5. 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.

6. 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. When the remaining cementitious solids have hardened, they shall be removed from the Site.
7. Damages to the washout container shall be repaired promptly.
8. 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.
9. Washout facilities shall be removed from the Site upon completion of the Work and the area restored as specified herein.

END OF SECTION

SECTION 01570 - EROSION CONTROL

PART 1 - GENERAL

1.1 SCOPE

A. This Section includes:

1. Installation of erosion and sediment control filter fabric fences.

2. Triangular filter fabric fences.

3. Straw bale fences and brush berms used during construction and prior to final development of site.

B. The purpose of control fences is to contain pollutants from overland flow.

1. Control fences are not for use in channelized flow areas.

1.2 UNIT PRICES

A. Measure and pay for filter fabric fence by linear foot of completed and accepted filter fabric fence installed around construction site. Limits of construction site are indicated on the Drawings.

B. Measure and pay for triangular filter fabric fence by linear feet of completed and accepted triangular filter fabric fence between limits of beginning and ending of wooden stakes.

C. Measure and pay for straw bale barrier by linear feet of completed and accepted straw bale barrier.

D. Measure and pay for brush berm by linear feet of completed and accepted brush berm.

1.3 REFERENCES

A. ASTM International (ASTM):

1. D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3).

2. D4355 - Standard Test Method for Deterioration of Geotextiles from Exposure to Light, Moisture and Heat in a Xenon-Arc Type Apparatus.

3. D4491- Standard Test Methods for Water Permeability of Geotextiles by Permittivity.

4. D4632 - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.

5. D4833 - Standard Test Method for Index Puncture Resistance of Geomembranes, and Related Products.

1.4 SUBMITALS

A. Manufacturer’s catalog sheets and other product data on geotextile fabric.

PART 2 - PRODUCTS

2.1 FILTER FABRIC

A. Provide woven or nonwoven geotextile filter fabric made of either polypropylene, polyethylene, ethylene, or polyamide material.

B. Geotextile fabric:

1. Grab strength of 100 pounds per square inch in any principal direction in accordance with ASTM D4632.

2. Puncture strength exceeding 115 pounds per square inch in accordance with ASTM D4833.

3. Equivalent opening size between 50 and 140 for soils with more than 15 percent by weight passing No. 200 sieve and between 20 and 50 for soil with less than 15 percent by weight passing No. 200 sieve.

4. Maximum water flow rate of 40 gallons per minute per square feet in accordance with ASTM D4491.

C. Filter fabric material shall contain ultraviolet inhibitors and stabilizers to provide expected usable life comparable to anticipated construction period.

1. Ultraviolet stability shall exceed 70 percent after 500 hours of exposure in accordance with ASTM D4355.

D. Manufacturers: The following or equal:

1. Mirafi, Inc.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Provide erosion and sediment control systems at locations as indicated on the Drawings.

1. Construct in accordance with requirements as indicated on the Drawings and of type indicated as specified in this Section.

B. No clearing, grubbing or rough cutting permitted until erosion and sediment control systems are in place, other than site work specifically directed by Project Manager to allow soil testing and surveying.

C. Maintain existing erosion and sediment control systems located within project site until acceptance of Project or until directed by Project Manager to remove and discard existing system.

D. Regularly inspect and repair or replace damaged components of erosion and sediment control systems as specified in this Section.

1. Unless otherwise directed, maintain erosion and sediment control systems until project area stabilization is accepted by the Authority.

2. Remove erosion and sediment control systems promptly when directed by Project Manager.

3. Discard removed materials off site.

E. Remove and dispose sediment deposits at designated spoil site for Project.

1. If a project spoil site is not indicated on the Drawings, dispose of sediment off site at location not in or adjacent to stream or floodplain.

2. Assume responsibility for off-site disposal.

3. Spread sediment evenly throughout site, compacted and stabilized.

4. Prevent sediment from flushing into a stream or drainage way.

5. If sediment has been contaminated, dispose of in accordance with existing federal, state, and local rules and regulations.

F. Unless otherwise indicated, compact embankments, excavations, and trenches by mechanically blading, tamping, and rolling soil in maximum of 8-inch layers.

1. Compaction density shall be at a minimum of 90 percent Standard Proctor ASTM D698 density.

2. Make at least 1 test per 500 cubic yards of embankment.

G. Prohibit equipment and vehicles from maneuvering on areas outside of dedicated rights-of-way and easements for construction.

1. Immediately repair damage caused by construction traffic to erosion and sediment control.

H. Conduct all construction operations under this Contract in conformance with erosion control practices described in Section 02370 - Riprap and Gabions Erosion and Sedimentation Control.

3.2 CONSTRUCTION METHODS

A. General

1. Provide erosion and sedimentation control systems as indicated on the Drawings.

    a. Install erosion and sedimentation control systems in manner that surface runoff shall percolate through system in sheet flow fashion and allow retention and accumulation of sediment.

2. Inspect erosion and sedimentation control systems after each rainfall, daily during periods of prolonged rainfall, and at minimum once each week.

    a. Repair or replace damaged sections immediately.
    b. Remove sediment deposits when silt reaches depth 1/3 height of fence or 6 inches, whichever is less.

B. Filter Fabric Fence

1. Attach filter fabric to 1-inch by 2-inch wooden stakes or driven steel rods spaced a maximum of 3 feet apart and embedded minimum of 8 inches or deeper to hold fence in place.

    a. If filter fabric is factory preassembled with support netting, then maximum spacing allowable is 8 feet.
    b. Install anchoring stakes or rods at slight angle toward source of anticipated runoff.
    c. Contractor is responsible for providing adequate fence anchoring appropriate for the varying soil and rock conditions at the well sites.

2. Trench in toe of filter fabric fence with spade or mechanical trencher so that downward face of trench is flat and perpendicular to direction of flow.

    a. V-trench configuration as indicated on the Drawings may also be used.
    b. Lay filter fabric along edges of trench.
    c. Backfill and compact trench.

3. Filter fabric fence shall have a minimum height of 18 inches and a maximum height of 36 inches above natural ground.

4. Provide filter fabric in continuous rolls and cut to length of fence to minimize use of joints.

    a. When joints are necessary, splice fabric together only at support post with minimum 6 inch overlap and seal securely.

C. Triangular Filter Fabric Fence

1. Attach filter fabric to fence structure fashioned from 6 gauge, 6-inch by 6-inch wire mesh, 18 inches on each side as indicated on the Drawings.

    a. Fabric cover and skirt should be continuous wrapping of fabric.
    b. Skirt should form continuous extension of fabric on upstream side of fence.

2. Secure triangular fabric filter fence in place using one of the following methods:

    a. Toe-in skirt 6 inches with mechanically compacted material.
    b. Weight down skirt with continuous layer of 3-inch to 5-inch graded rock.
    c. Trench-in entire structure 4 inches.

3. If provided, anchor triangular fabric filter fence structure and skirt securely in place using 6 inch wire staples on 2-foot centers on both edges and on skirt, or staked using 18-inch by 3/8-inch diameter re-bar with tee ends.

4. Lap over fabric filter material by 6 inches to cover segment joints.

    a. Fasten joints with galvanized shoat rings.

D. Straw Bale Fence

1. Bound bales with either wire, nylon or polypropylene rope tied across hay bales.

    a. Do not use jute or cotton bindings.

2. Place bales in row with ends tightly abutting adjacent bales.

    a. Place bales with bindings parallel to ground surface.

3. Embed bale in soil a minimum of 4 inches.

4. Securely anchor bales in place by 3/8-inch rebar stakes driven through bales a minimum of 18 inches into ground.

    a. Angle first stake in each bale toward previously laid bale to force bales together.

5. Fill gaps between bales with straw to prevent water from escaping between bales.

    a. Wedge carefully in order not to separate bales.

6. Replace with new straw bale fence every 2 months.

E. Brush Berm

1. Construct brush berm along contour lines by hand placing method.

    a. Do not use machine placement of brush berm.

2. Use woody brush and branches having diameter less than 2-inches with 6-inches overlap.

    a. Avoid incorporation of annual weeds and soil into brush berm.

3. Use minimum height of 18-inches measured from top of existing ground at upslope toe to top of berm.

    a. Top width shall be 24 inches minimum and side slopes shall be 2:1 or flatter.

4. Embed brush berm into soil a minimum of 4-inches and anchor using either wire, nylon or polypropylene rope across berm with a minimum tension of 50 pounds.

    a. Tie rope securely to 18-inch x 3/8-inch diameter rebar stakes driven into ground on 4 foot centers on both sides of berm.

End of Section

SECTION 01580 – PROJECT SIGNS

PART 1 - GENERAL

1.01 SUMMARY

A. Contractor shall provide all material, labor and equipment necessary for the fabrication, printing and installation of Project signs.

B. This section covers project sign requirements for all Kansas City, Missouri - Water Services Department projects. Project sign requirements include the following:

1. Project identification sign description.
2. Project sign installation.
3. Maintenance and removal of Project sign.
4. Printing of signs.
5. Installation of signs.

1.02 SPECIFICATION MODIFICATIONS

A. It is understood that throughout this section these Specifications may be modified by appropriate items in Section 01015 – Specific Project Requirements or as otherwise indicated on the Drawings.

1.03 RELATED SECTIONS

A. Section 01015 – Specific Project Requirements.

B. Section 01300 – Submittals.

C. Section 01581 – Public Communications.

1.04 INFORMATION PROVIDED BY THE CITY

A. City shall provide the graphic design templates of the Project sign in an electronic format to be used in the printing process.

1.05 SUBMITTALS

A. Submit as specified in Section 01300 – Submittals.

B. Shop Drawings (not used).

C. Product Data (not used).

D. Samples.

E. Other:

1. Project Sign Locations – submit for review and approval a map of the Project area of marked up Drawings showing the location and orientation of each project sign.
2. Submit for review and approval notifications to homeowners and business adjacent to the location of the Project signs.
3. Re-use of Placards – if the Contractor has salvaged placards from previous projects, they may be re-used if approved by the City. Submit color photographs that accurately show the condition of each placard to be re-used for review and approval.
4. Notice of Removal – submit written notification to City that all Project signs have been removed.

PART 2 - PRODUCTS

2.01 PRINTERS

A. A list of printing companies that have previous experience with printing signs for the City are included in Section 01015 – Specific Project Requirements.

2.02 FRAME

A. Metal frame and hardware shall be in conformance with Water Services standard detail D-20142 – Installation Detail for Project Signs (see Figure 3).

2.03 PLACARDS

A. Upper Placard Size – 6 feet wide by 4 feet tall.
B. Lower Placard Size – 6 feet wide by 1 foot tall.
C. Material – Coroplast® corrugated plastic sheeting or approved equal.
D. Sheeting Thickness – ½ inch.
E. Sheeting Color – white.
F. Print Method – direct to Coroplast® with outdoor UV laminate coating.

2.04 PLACARD CONTENT

A. Construction Phase Upper Placard – for each Project sign the Contractor shall provide an upper placard which will be displayed through construction. An example of the Construction Phase Upper Placard is shown in Figure 1.
B. Post-Construction Phase Upper Placard – for each Project sign the Contractor shall provide an upper placard which will be displayed post construction. An example of the Construction Phase Upper Placard is shown in Figure 2.
C. Lower Placard – for each Project sign, the Contractor shall provide a lower placard. Examples of the Lower Placard are shown in Figures 1 and 2.
D. The City will provide digital files for all placards and graphic images.

2.05 NUMBER OF SIGNS TO BE PROVIDED

A. The number of project signs to be provided is defined in Section 01015 – Specific Project Requirements. Each Project sign includes the following:
    1. One (1) Construction Phase Upper Placard to be displayed during construction.
    2. One (1) Post-Construction Phase Upper Placard to be displayed after completion of the Work.
    3. One (1) Lower Placard to be displayed during construction and post-construction.
    4. Printing of placards.
B. Frame as shown in Water Services standard detail D-20142 – Installation Detail for Project Signs (see Figure 3).

PART 3 - EXECUTION

3.01 INSTALATION AND PLACEMENT OF SIGNS

A. Installation – Project signs shall be fabricated and installed in accordance with Water Services standard detail D-20142 – Installation Detail for Project Signs (see Figure 3).

B. Location – Project signs shall be located within the Site as defined by Section 00700 General Conditions. Project signs shall be erected in a conspicuous place but shall not interfere with the vision of pedestrian or vehicular traffic such as to create a hazard. Signs shall be located in the public right of way or in an easement acquired for the Project**.** Locations of the signs shall be coordinated with the City prior to installation and submitted accordance with paragraph 1.05 SUBMITTALS.
C. Notifications – the Contractor shall notify any homeowners or businesses adjacent to the location of the signs at least three (3) days prior to erecting signs.
D. Project sign(s) shall be erected not less than two (2) days before the start of construction activities. No construction activities are allowed until the Project signs are erected.
E. Project signs shall remain in place for the duration of the Project and shall be maintained in a true, plumb and neat condition.

3.02 REPLACEMENT OF UPPER PLACARDS

A. Upon completion of the Work and at the direction by the City, the Contactor shall remove the Construction Phase Upper Placard (Figure 1) on all Project signs and replace them with the Post-Construction Upper Placard (Figure 2).
B. The Lower Placards are to remain in place.

3.03 REMOVAL OF PROJECT SIGNS

A. All Project signs shall be maintained for thirty (30) calendar days after completion of the Work or as otherwise directed by the City.
B. Contractor shall remove all Project signs and restore the area disturbed by construction activities.
C. Project signs shall be removed from the Project areas and will become property of the Contractor.
D. The Contractor may dispose of Project signs or salvage and reuse them on future City projects. The City will assess the condition of the signs and determine the appropriateness of reuse.
E. Within three (3) days of the removal of signs, Contractor shall provide the City written notice that all Project signs have been removed from the Site.

Figure 1 – Example Construction Phase Upper Placard and Lower Placard

Figure 2 – Example Post-Construction Phase Upper Placard and Lower Placard

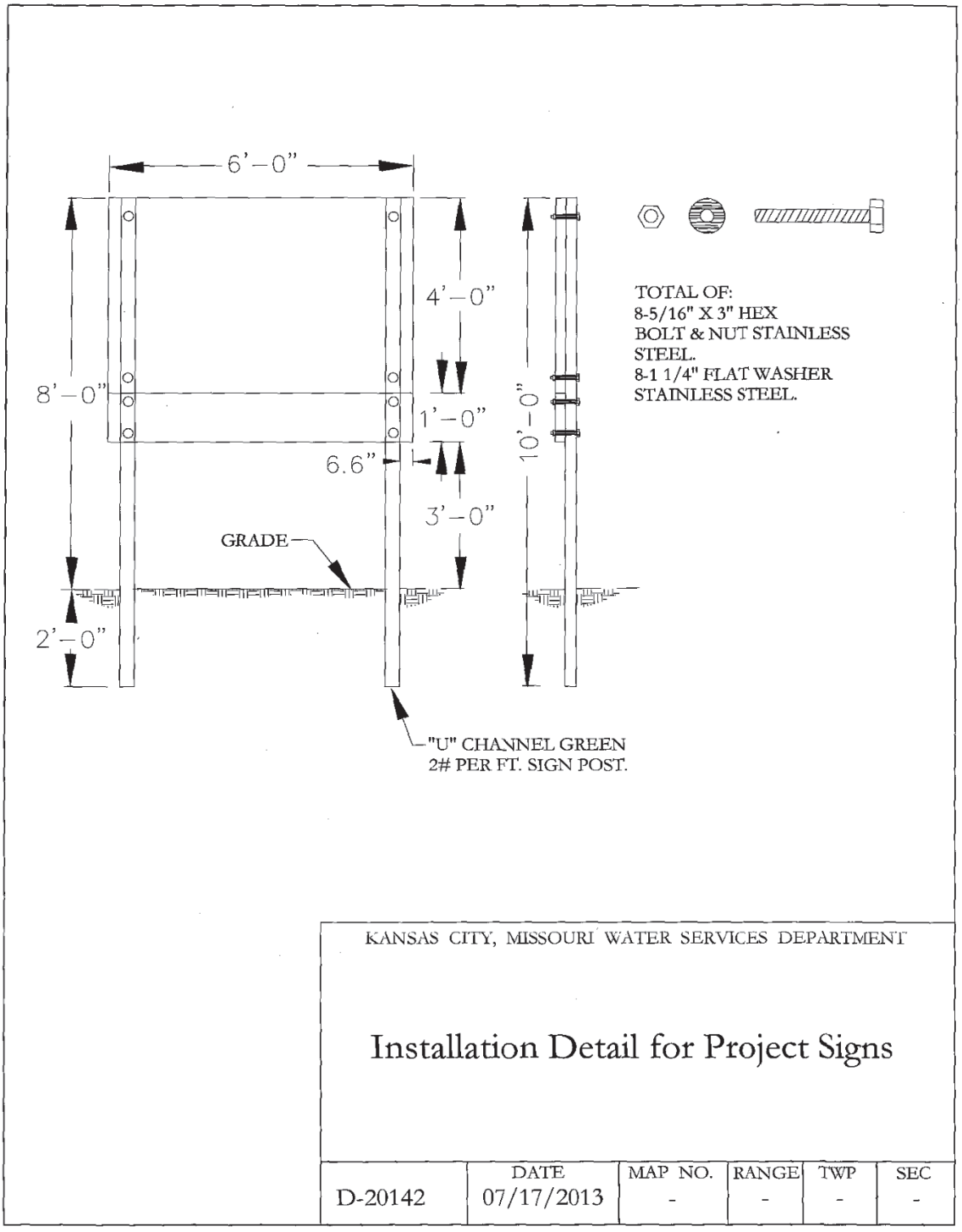


Figure 3 – Installation Detail for Project Signs

END OF SECTION

SECTION 01581 – PUBLIC COMMUNICATIONS

PART 1 - GENERAL

1.01 SUMMARY

A. This section covers communication procedures between the contractor and the public affected by construction activities.

B. Any time the contractor is acting on behalf of the City to perform work, the communications material between the contractor and the public shall adhere to these technical standards and is subject to review and approval by the City.

1.02 RELATED SECTIONS

A. Section 00700 – General Conditions:
   1. Article 6, paragraph 6.14 – Safety and Protection.

B. Section 01015 – Specific Project Requirements.

C. Section 01300 – Submittals.

1.03 DEFINITIONS

A. Affected Properties – homeowners, businesses, tenants or other entities whose everyday activities could be affected by the work.

1.04 INFORMATION PROVIDED BY THE CITY

A. The City will provide the contractor with an electronic file for mailing communications to affected property owners for the purpose of Project communications.

B. The City will provide the contractor with an electronic copy of approved communications templates to be distributed to affected properties.

1.05 SUBMITTALS

A. Submit as specified in Section 01300 – Submittals.

B. Notifications – Submit for review and approval all notification materials developed by the Contractor that are to be distributed to affected properties.

1.06 PUBLIC MEETINGS

A. Description – The contractor shall attend and participate in public meetings held for the project. The contractor's project manager shall attend and present project details. These details include, but are not limited to, the following:
   1. Project schedule.
   2. Project phasing.
   3. Disruptions to the neighborhood.
   4. Work hours.
   5. Temporary restoration efforts.
   6. Final restoration efforts.
   7. Field contact information.

B. The City will provide a location, date and time of the meeting and will facilitate the meeting.

C. See Section 01015 – Specific Project Requirements for additional meeting requirements.

1.07 DOOR HANGERS AND OTHER PRINTED COMMUNICATIONS

A. Description – Door hangers and other printed communications (fact sheets, post cards, signs, etc.) used throughout construction shall be distributed to inform homes and businesses of disruptions.

B. Templates – The City will provide templates for door hangers and other printed communications in an electronic format. See Figures 1 through 5 for an example door hanger.

C. Template Modification – The contractor may need to annotate the printed door hangers with project specific information. This effort may include describing the work and adding applicable date and time information for the benefit of the resident.

D. Review communications material – Review and approval of the communication materials by the City is required prior to the contractor's distribution of materials.

E. Printing and Reproduction – The contractor shall print door hangers, mailers and all other communication materials needed for the project.

F. Distribution List – The list of affected property owners will be provided by the City.

G. Mailing and Distribution – The contractor shall distribute the door hangers and other printed communications to the affected property owners. Door hangers are to be hand-delivered and not placed in the mailbox. All other printed communications will be delivered in a manner acceptable to the City.

H. Costs – All costs to develop, reproduce, deliver or mail notifications shall be included in the contractor's lump sum bid price.

1.08 NOTIFICATION OF UTILITIES

A. Notify utilities in accordance with Section 00700 – General Conditions, Article 6.

1.09 NOTICES TO PROPERTY OWNERS AND AUTHORITIES

A. As provided in Section 00700 - General Conditions, Article 6, the Contractor shall notify adjacent property owners and utilities when execution of the work may affect them.

B. Work Notice:
   1. General notice to affected property owners in advance of the work. Notice is required for any work within an easement. Notice shall be given for work within the City's right-of-way, outside of the street.
   2. Type of notification shall be a door hanger.

C. Denial of Access:
   1. Notice for when it is necessary to temporarily deny access to property, driveway, sidewalk or other facility.
   2. Type of notification shall be a door hanger.

D. Smoke Testing:
   1. Notice for when the Project involves smoke testing.
   2. Type of notification shall be a door hanger.

E. Utility Service Interruption:
   1. Notice for when any utility service connection must be interrupted.
   2. Type of notification shall be a door hanger.

F. Street Closures and Changes to Traffic Patterns:
   1. Notices to utilities and other concerned agencies prior to cutting or closing streets or other traffic areas or excavating near underground utilities or pole lines.
   2. Provide any additional notifications required by the traffic control permit.
   3. Type of notification will be written communication prepared and distributed by the Contractor.

G. Schedule – Notices shall be received by the affected properties no less than two (2) and no more than seven (7) calendar days prior to the work, denial of access, smoke testing, utility service interruption, street closures and changes to traffic patterns or other work that may require notification.

1.10 OTHER COMMUNICATIONS

A. See Section 01015 – Specific Project Requirements for additional communication requirements not specifically included herein or otherwise required by the Contract Documents.

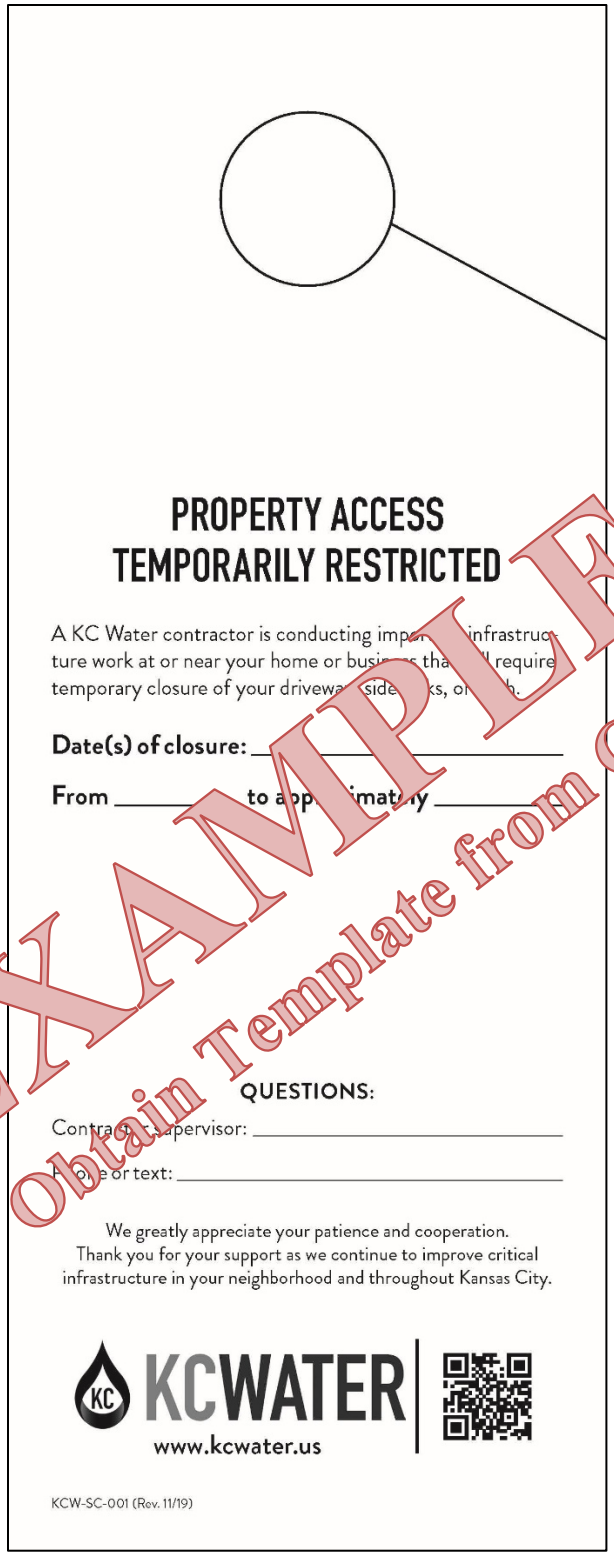
PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

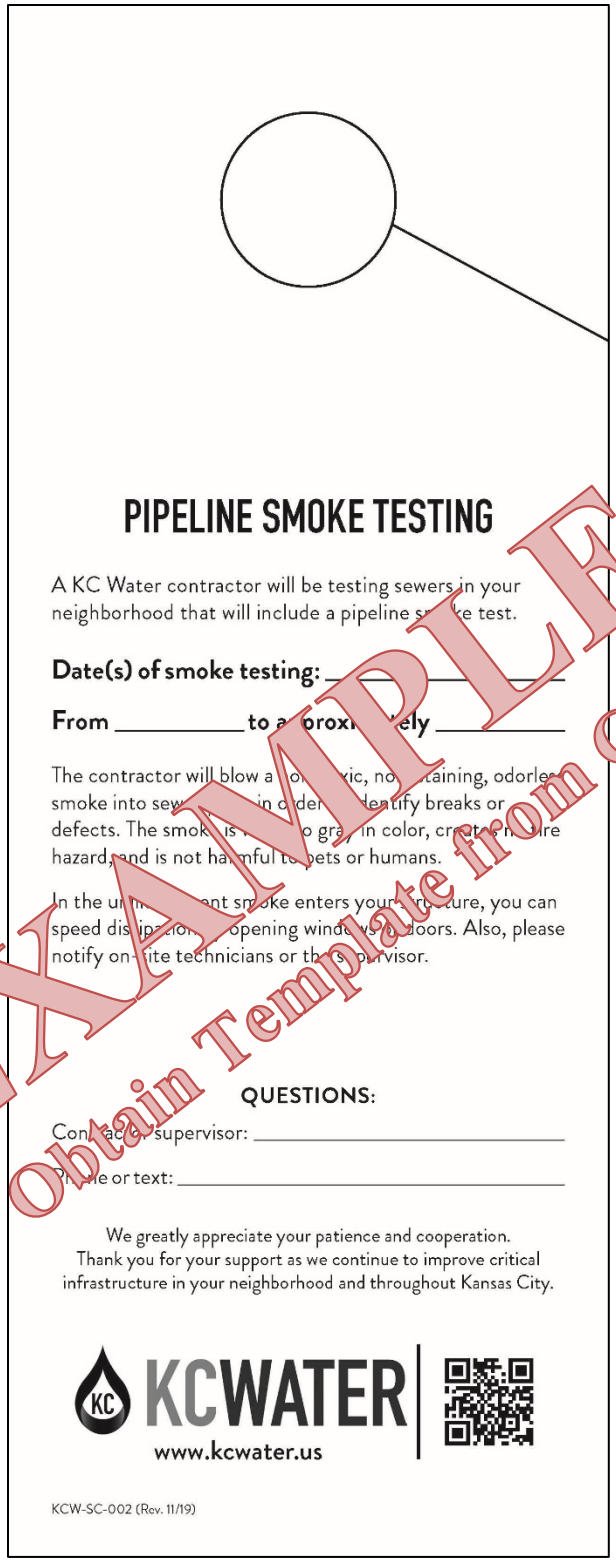
Not used.

See example templates on pages 4-9.



EXAMPLE
Obtain Template from City

Figure 1 – Restricted Access Door Hanger



PIPELINE SMOKE TESTING

A KC Water contractor will be testing sewers in your neighborhood that will include a pipeline s[illegible]e test.

Date(s) of smoke testing: _____

From _____ to a[illegible]ely _____

The contractor will blow a [illegible]ic, no[illegible]taining, odorless smoke into sew[illegible] in o[illegible]der [illegible]dentify breaks or defects. The smok[illegible] is [illegible]o gra[illegible] in color, cr[illegible]e[illegible]re hazard, and is not ha[illegible]mful t[illegible]pets or humans.

In the u[illegible]nt sm[illegible]oke enters your [illegible]ructure, you can speed dis[illegible]o[illegible] opening windows or doors. Also, please notify on-[illegible]ite technicians or th[illegible] supervisor.

QUESTIONS:

Con[illegible]ac[illegible] supervisor: _____

[illegible]e or text: _____

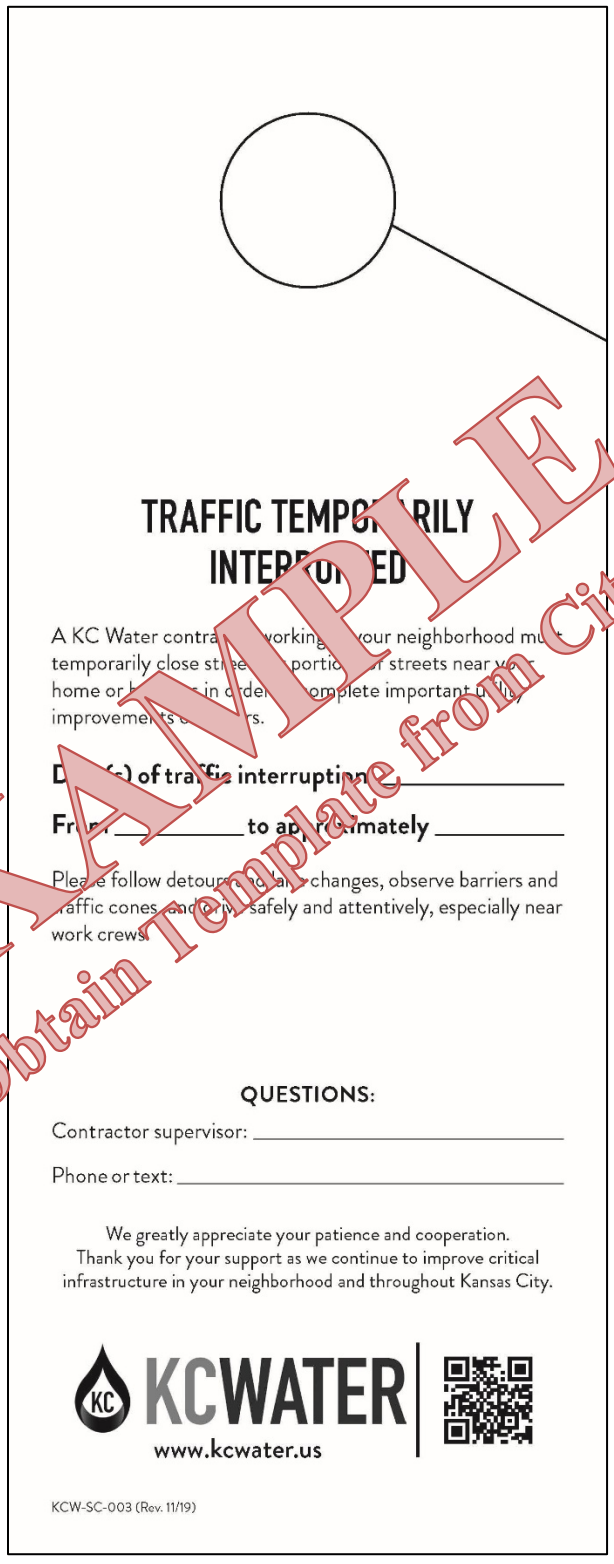
We greatly appreciate your patience and cooperation.
Thank you for your support as we continue to improve critical infrastructure in your neighborhood and throughout Kansas City.

KCWATER
www.kcwater.us

KCW-SC-002 (Rev. 11/19)

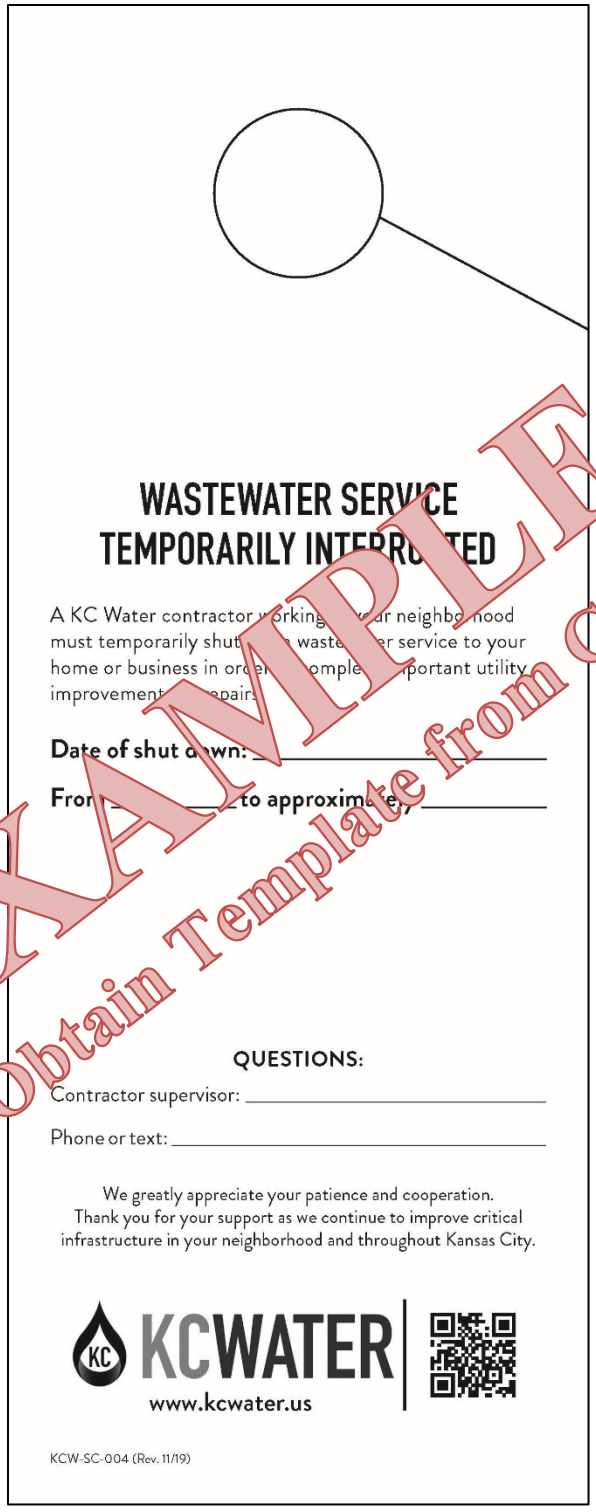
EXAMPLE
Obtain Template from City

Figure 2 – Smoke Testing Door Hanger



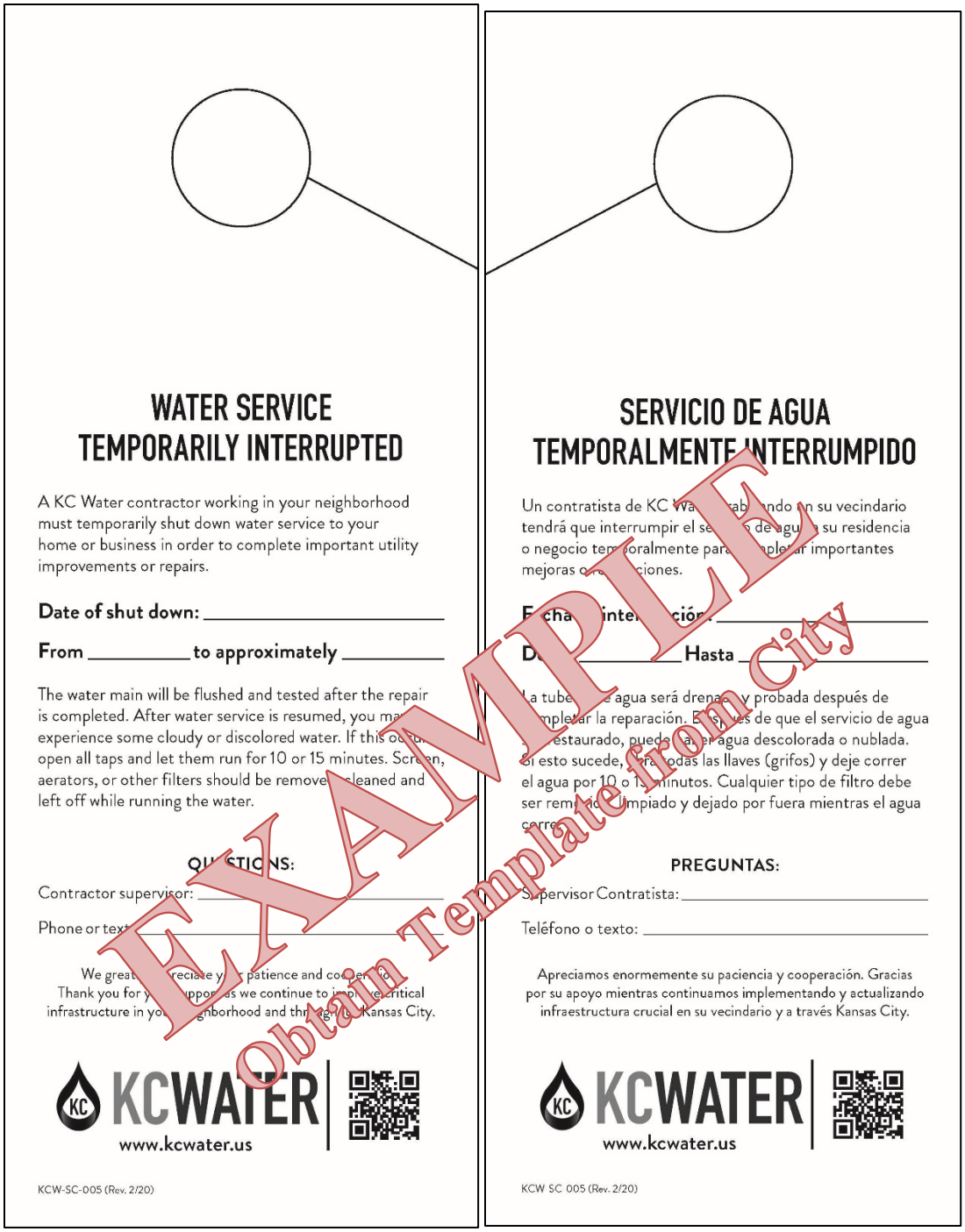
EXAMPLE
Obtain Template from City

Figure 3 -Traffic Interruption Door Hanger



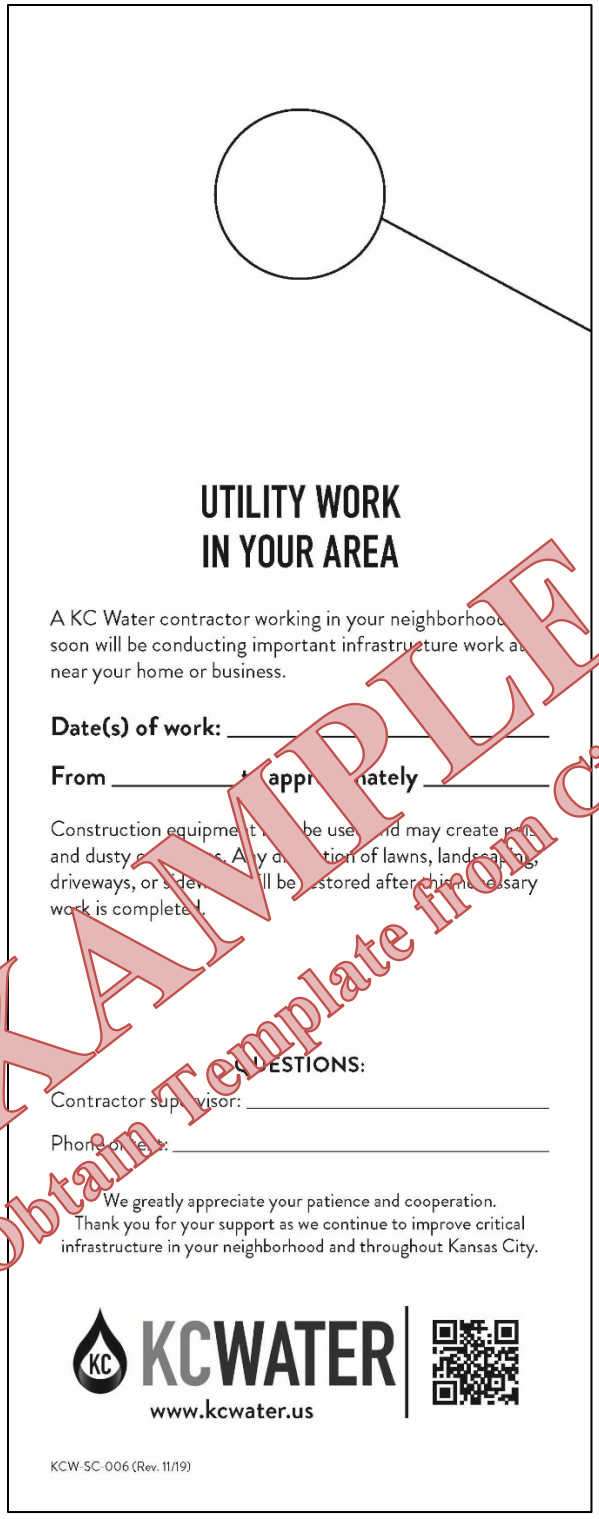
EXAMPLE
Obtain Template from City

Figure 4 – Wastewater Service Interruption Door Hanger



EXAMPLE
Obtain Template from city

Figure 5 – Water Service Interruption Door Hanger



EXAMPLE
Obtain Template from City

Figure 6 – Work Notice Door Hanger

END OF SECTION

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 01900 – CONTRACT CLOSEOUT

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes administrative and procedural requirements for contract closeout.

B. Closeout requirements for specific construction activities are included in the appropriate Sections of the Contract Documents.

1.02 SPECIFICATION MODIFICATIONS

A. It is understood that throughout this Section these Specifications may be modified by appropriate items in Section 01015 – Specific Project Requirements, or as otherwise indicated on the Contract Drawings.

1.03 RELATED SECTIONS

A. Section 00700 – General Conditions.

B. Section 00800 – Supplementary Conditions.

C. Section 01015 – Specific Project Requirements.

D. Section 01020 – Record Documents.

E. Section 01300 – Submittals.

1.04 DEFINITIONS

A. Achievement of Full Operation/Substantial Completion: See Section 00700 – General Conditions, paragraph 1.01.

B. Substantial Completion: See Section 00700 – General Conditions, paragraph 1.01.

1.05 INFORMATION PROVIDED BY THE CITY

A. Achievement of Full Operation or Substantial Completion (Section 00700, paragraph 14.04):

1. If applicable, City will provide written notification that the Work does not meet the requirements for Achievement of Full Operation or Substantial Completion
2. Certification of Achievement of Full Operation (Section 01290.12) or Certificate of or Substantial Completion.
3. 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. Partial Utilization (Section 00700, paragraph 14.05):

1. Written request for partial utilization.

C. Punch list (Section 01290.13).

D. Final Inspection (Section 00700, paragraph 14.06):

1. Written report of all in which the Final Inspection reveals that the Work is incomplete or defective.

1.06 SUBMITTALS

A. Submit as specified in Section 01300 – Submittals.

B. Other Submittals:

1. Notification of Achievement of Full Operation or Substantial Complete (Section 00700, paragraph 14.04.A).
2. List of Incomplete Items (Section 00700, paragraph 14.04.A).
3. Notification that the Work is complete and ready for Final Inspection (Section 00700, paragraph 14.06.A).
4. List of Uncompleted Work (paragraph 3.01.C).
5. Certification of Partial Substantial Completion (Section 00700, paragraph 14.05.A.1) if Partial Utilization is requested by City.
6. Closeout Documentation:
   (a) The following items are required to be submitted prior to the Contractor's application for Final Payment as required by Section 00700 – General Conditions, paragraph 14.07:
      (i) Maintenance and Operating Instructions.
      (ii) Schedules.
      (iii) Guarantees.
      (iv) Bonds.
      (v) Certificates or other evidence of insurance.
      (vi) Certificates of inspection.
      (vii) Record Documents (Section 01020 – Record Documents).
   (b) The following items are required to be submitted with the Contractor's application for Final Payment as required by Section 00700 – General Conditions, paragraph 14.07:
      (i) Contractor Affidavit for Final Payment (Section 01290.14).
      (ii) Subcontractor Affidavit for Final Payment (Section 01290.15).
   (c) Authorization to Release a Revenue Clearance Letter (Section 00630).
   (d) All other documentation necessary for an Application for Progress payment (Section 00700, Article 14).
7. Consent of Surety to Make Final Payment certificate.

PART 2 - PRODUCTS

A. Not used.

PART 3 - EXECUTION

3.01 ACHEIVEMENT OF FULL OPERATION / SUBSTANTIAL COMPLETION

A. Refer to Section 00700 – General Conditions, Article 14.

B. Refer to Section 00800 – (Overflow Control Plan Consent Decree) Supplementary Conditions, paragraph SC-14.04 for additional information to define items of the Work to be included in the definition of Achievement of Full Operation or Substantial Completion.

C. List of Uncompleted Items: The Contractor shall submit a list of incomplete items that are required for the Work, but not required for Achievement of Full Operations / Substantial Completion. The list shall include a description of the Work, the value of each item, reasons the work is not complete, and a schedule for completion.

D. The inspection associated with the Achievement of Full Operation / Substantial Completion will be scheduled at a mutually agreed time between the Contractor, Design Professional and the City's Representative.
E. City will provide a punch list (Section 01290.13) of items that require completion or correction. Items noted on the punch list may not be all-inclusive and the failure to include any items on the list does not alter the responsibility of the Contractor to complete all the Work in accordance with the Contract Documents.
F. Items identified in the punch list shall be addressed by the Contractor prior to the Final Inspection.

3.02 PARTIAL UTILIZATION

A. Refer to Section 00700 – General Conditions, paragraph 14.05, Partial Utilization.

3.03 FINAL INSPECTION

A. Refer to Section 00700 – General Conditions, paragraph 14.06, Final Inspection.
B. The Final Inspection will be scheduled at a mutually agreed time between the Contractor, Design Professional and City's Representative.
C. The City will provide the Contractor with the results of the final inspection.
D. If the Work is incomplete or unacceptable, the City will advise the Contractor of Work that is incomplete or other obligations that have not been fulfilled but are required for final acceptance. The Contractor shall address items that need to be corrected, and then request a re-inspection of the Work.
E. Re-inspection of the Work:
    1. If necessary, the City will re-inspect the Work upon receipt of notice that the Work, including punch list items from the first inspection, has been completed, except for items whose completion is delayed under circumstances acceptable to the City.
    2. If necessary, re-inspections will be repeated until all deficiencies have been remedied by the Contractor.

A. Approval of the Work by the City or Design Professional will not relieve the Contractor of their responsibility under other terms of the Contract.

3.04 FINAL PAYMENT

A. After Contractor has completed all corrections (after the Final Inspection) to the satisfaction of City, Contractor shall submit the Final Payment request. Refer to Section 00700 – General Conditions, paragraph 14.07, Final Payment.
B. Documents to be submitted with, or prior to, the application for final payment shall be as required by the Contract Documents. See paragraph 1.06 for a summary.
C. Authorization to Release a Revenue Clearance Letter: If the Contract exceeds $160,000 and if Work is performed for a term longer than one (1) year, then in addition to the requirements of Section 00700, the Application for Final Payment shall be accompanied by a clearance letter from the Finance Department, Revenue Division. The Contractor shall keep a copy of all subcontractors' clearance letters in its contract files in accordance with the contract documents. See Section 00630.
D. For Contracts that include a Green Infrastructure Establishment Period, there will be a Final Payment for the Work associated with construction, and a separate Final Payment for the Work associated with the maintenance of green infrastructure through the establishment period. The Final Payment for Work associated with construction shall exclude the amount for maintenance of green infrastructure indicated in the Schedule of Values.

3.05 LIQUIDATED DAMAGES

A. If required, liquidated damages shall be assessed in accordance with the Contract Documents. Refer to Section 00700 – General Conditions, paragraph 12.01 and Section 00800. See Supplementary Conditions, paragraph SC-12.01 for additional information.

END OF SECTION

SECTION 02050 - DEMOLITION

PART 1 - GENERAL

1.1 SCOPE

A. This section covers the demolition of existing structures, piping, equipment, and sitework and the salvage of existing materials and equipment as specified herein.

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 OK Creek Culverts and Turkey Creek Pump Station which are not to be removed must remain in continuous operation during the work.

C. Demolition and salvage work shall create minimum interference with City's operations and minimum inconvenience to City. 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, City 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 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. Structure Demolition

1. The following structures at the OK Creek Culverts shall be demolished, and the debris shall be removed from the jobsite.

a. Common Wall for Overflow Weir (Typ of 7)
b. Common Wall to North Culvert for Diversion (Typ of 1)
c. Grating and Accessories (Typ of 2)
d. Guard Rail around Landing as needed

E. Piping and Equipment Demolition

1. Approximately 30 feet of buried RCP pipe.

F. Sitework Demolition

1. Areas as indicated on the Drawings.

3.2 SALVAGE.

A. Items To Be Salvaged by City – Not Used

B. Items To Be Salvaged by Contractor

1. Removed and salvaged equipment or facilities shall include removal and salvage of all accessories, piping, wiring, supports, associated electrical starters and devices, baseplates and frames, and all other appurtenances, unless otherwise directed.

2. Existing materials and equipment removed, and not reused as a part of the work, shall become Contractor's property unless otherwise specified, and shall be removed from the jobsite:

a. Gate on 15” RCP storm drainpipe in the South Rock Box with tag SG-6.

3. The following existing materials and equipment shall be removed by Contractor, shall be reused as a part of the work, and shall remain the property of City: None

4. Contractor shall carefully remove, in a manner to prevent damage, all materials and equipment specified herein or indicated to be salvaged and to remain the property of City. Contractor shall store and protect salvaged items specified or indicated to be reused in the work. Any items damaged in removal, storage, or handling through carelessness or improper procedures shall be replaced by Contractor in kind or with new items.

5. Contractor may, at his option, furnish and install new items instead of those specified or indicated to be salvaged and reused, in which case such removed items will become Contractor's property.

End of Section

SECTION 02202 – TRENCHING AND BACKFILLING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes: Trench excavation, fine grading, pipe bedding, backfilling, and compaction for the following, including requirements for ditch crossings:

1. Pipes.
2. Direct buried electrical and control conduits.
3. Electrical and control duct banks.
4. Manholes, valves, or other accessories.
5. Potable water pipe and appurtenances.

1.2 REFERENCES

A. ASTM International (ASTM):

1. D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand Cone Method.
2. D1557 - Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)).
3. D6938 - Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth).

1.3 SUBMITTALS

A. Lab certification.

B. Confirmation test reports.

1.4 QUALITY ASSURANCE

A. Initial compaction demonstration:

1. Adequacy of compaction equipment and procedures: Demonstrate adequacy of compaction equipment and procedures before exceeding any of following amounts of earthwork quantities:

2. 100 linear feet of trench backfill.

3. Compaction sequence requirements: Until specified degree of compaction on previously specified amounts of earthwork is achieved, do not perform additional earthwork of the same kind.

4. After satisfactory conclusion of initial compaction demonstration and at any time during construction, provide confirmation tests as specified under "FIELD QUALITY CONTROL."

PART 2 - PRODUCTS

2.1 MATERIALS

A. Soil and rock materials:

1. Aggregate Base Course:

a. Consist of hard, durable particles or fragments of stone or gravel, screened or crushed to required size and grading and free from vegetable matter, lumps or balls of clay, alkali, adobe, or other deleterious matter.
b. When sampled and tested in accordance with specified test methods, material shall comply with following requirements:
1) Durability: Percentage of wear not greater than 40 percent when tested in accordance with ASTM C 131.
2) Plasticity index: Shall not be more than 5 when tested in accordance with ASTM D 4318.
3) Liquid limit: Shall not be more than 25 percent when tested in accordance with ASTM D 4318

c. Aggregate Base Course for Structures, Pipe Bedding material and Roadway base shall be MoDOT Type 1 Aggregate Base Course as specified by Sections 304 and 1004 in the Missouri Department of Transportation, Standard Specifications for Highway Construction.

2. Gravel:

a. Consists of hard, durable particles or fragments of stone or gravel; screened or crushed to specified sizes and gradations; and free from organic matter, lumps or balls of clay, alkali, adobe, or other deleterious matter.
b. When sampled and tested in accordance with specified test methods, material shall comply with following requirements:
1) Durability: Percentage of wear:
a) Class C: Not greater than 37 when tested in accordance with ASTM C131.
b) Class D: Not greater than 40 when tested in accordance with ASTM C535.

2) Plasticity index:
   a) Class E: Not greater than 12 when tested in accordance with ASTM D4318.
3) Liquid limit:
   a) Class E: Not greater than 40 percent when tested in accordance with ASTM D4318.

c. Conforms to sizes and grade within the following limits when tested in accordance with ASTM C117 and C136.

Sieve Size (Square Openings)	Percent by Weight Passing Sieve		
	Class C	Class D	Class E
3 inch	--	--	100
2 inch	--	100	--
1-1/2 inch	--	90 - 100	--
1 inch	100	--	--
3/4 inch	90 - 100	0 - 5	70 - 100
3/8 inch	10 - 55	--	--
Number 4	0 - 10	--	--
Number 200	--	--	0 - 35

3. Native material:

   a. Sound, earthen material passing 1-inch sieve.
   b. Percent of material by weight passing Number 200 sieve shall not exceed 30 when tested in accordance with ASTM C136.
   c. Expansion index less than 35 when tested in accordance with ASTM D4829.

4. Sand:

   a. Clean, coarse, natural sand.
   b. Non-plastic when tested in accordance with ASTM D4318.
   c. 100 percent shall pass a 1/2-inch screen.
   d. No more than 20 percent shall pass a Number 200 sieve.

5. Select material:

   a. Sound earthen material for which the sum of plasticity index when tested in accordance with ASTM D4318 and the percent of material by weight passing a Number 200 sieve shall not exceed 23 when tested in accordance with ASTM C136.
   b. Organic content shall not be greater than 3 percent by volume.

B. Flowable Backfill / Controlled Low Strength Material (CLSM): A mixture of portland cement, fly ash (optional), fine aggregate, water, and admixtures (as approved by the Engineer) proportioned to a consistency to fill voids without vibration. Flowable Backfill (CLSM) shall consist of:

1. 1. Cement: The portland cement shall conform to ASTM C 150, Type 1 or Type II.

2. 2. Fly ash: Fly ash, when used, shall conform to the requirements of ASTM C 618 Class C or F.

3. 3. Fine Aggregate: Fine aggregate shall conform to ASTM C 33.

4. 4. Mixing Water: Mixing water shall conform to ASTM C 1602.

5. 5. Admixtures: Air entrainment, when used, shall conform to ASTM C 260. Water reducing admixtures, when used, shall conform to ASTM C 494. All other admixtures shall only be used when approved by the Engineer.

6. 6. Other materials: Proposed replacement or supplementary materials shall be approved by the Engineer and in conformance with current NRMCA or ACI guidelines for CLSM.`

PART 3 - EXECUTION

3.1 PREPARATION

A. General:

1. Embankment condition:

a. Exists where width of trench exceeds limits specified in this Section.
b. Before laying pipes in fill, place fill and compact it to not less than 2 feet above top of pipe.
c. After placing and compacting fill, excavate pipe trench through fill.

B. Protection: Stabilize trench excavations as specified in Section 02260 - Excavation Support and Protection.

3.2 INSTALLATION

A. Trench excavation:

1. General requirements:

a. If, because of soil conditions, safety requirements, or other reasons, trench width at top of pipe is increased beyond width specified in this Section, upgrade laying conditions or install stronger pipe designed in conformance with Specifications for increased trench width, without additional cost to City.

b. Excavate bottom of trench to depth indicated on the Drawings. The bottom of the trench excavation shall be firm and dry.

2. Scarify and recompact bottom of trench: Scarify bottom of trench to a depth of 6 inches. Recompact scarified material to 95 percent of maximum density.

3. Rock:

a. Pipe: If bottom of trench excavation is found to consist of rock or any material that by reason of its hardness cannot be excavated to provide uniform bearing surface, remove such rock or other material to a depth of not less than 4 inches below bottom of fine grading material. Backfill overcut with aggregate base course material compacted to 95 percent of maximum density up to bottom of fine grading material.
b. Direct buried electrical and control conduits: If bottom of trench excavation is found to consist of rock or any material that by reason of its hardness cannot be excavated to provide uniform bearing surface, remove such rock or other material to a depth of not less than 4 inches below bottom of conduit bedding material. Backfill overcut with aggregate base course material up to bottom of conduit bedding material.
c. Electrical and control duct banks: If bottom of trench excavation is found to consist of rock or any material that by reason of its hardness cannot be excavated to provide uniform bearing surface, remove such rock or other material to a depth of not less than 4 inches below bottom of concrete duct bank. Backfill overcut with aggregate base course material up to bottom of concrete duct bank.

4. Overcut of trench bottom: Where the bottom of the trench is excavated below the depth indicated on the Drawings, restore trench bottom to proper grade by back filling with aggregate base course material compacted to 95 percent of maximum density, at no additional cost to City.

5. Soft or unstable material:

a. If bottom of excavation is found to consist of soft or unstable material which is incapable of providing proper support, remove such material to a depth and for the length required, as determined by the Engineer. Backfill trench to bottom of fine grading material with aggregate base course material compacted to 90 percent of maximum density.

6. Concrete cradle: Where indicated on the Drawings, cradle pipe in concrete.

7. Trench widths:

a. Minimum clear width of trench for pipe (measured at top of pipe):
1) For pipe sizes 4 inches to and including 24 inches: Not less than outside diameter of pipe plus 18 inches.
2) For pipe sizes larger than 24 inches: Not less than outside diameter of pipe plus 24 inches.

b. Maximum clear width of trench for pipe (measured at top of pipe):

1) For pipe sizes 4 inches to and including 24 inches: Not to exceed outside diameter of pipe plus 24 inches.
2) For pipe sizes larger than 24 inches: Not to exceed outside diameter of pipe plus 36 inches.

8. For manholes, valves, or other accessories:

a. Provide excavations sufficient to leave at least 12 inches clear between their outer surfaces and sides of trench or shoring.
b. Backfilling of manhole excavation: Conform to backfilling requirements as specified for trenches in this Section.
c. Backfill under manholes, vaults, tanks, or valves with aggregate base course material. Do not backfill with soil.
d. Fill any unauthorized excess excavation below elevation indicated on the Drawings for foundation of any structure with aggregate base course material at no additional cost to City.

9. Potable water pipe and appurtenances:

a. Lay in trenches separate from those used for sewers.
b. Unless otherwise specified or indicated on the Drawings, lay in trenches having cover of not less than 3 feet below surface of ground and located at distance of not less than 10 feet from any parallel sewer trench.

10. At road crossings or existing driveways:

a. Make provision for trench crossings at these points, either by means of backfills, tunnels, or temporary bridges.

B. Dewatering:

1. The Contractor shall maintain a dry and stable excavation, obtain necessary permits, and provide for the proper method of discharging water from the work site at all times until installation is completed.

2. The Contractor shall not allow hydrostatic pressure flotation or other adverse effects to cause damage to the structure or pipeline.

3. Proper dewatering techniques are the Contractor's responsibility. All work performed by the Contractor that is adversely affected by his/her failure to adequately dewater trenches will be subject to rejection by the Engineer. The Contractor shall repair and/or replace affected structures or pipelines.

4. The Contractor shall remove any water that may accumulate or be found in the trenches and other excavations made as part of the work.

5. Grading shall be done to prevent surface water from flowing into trenches or other excavations, and to maintain the flow of water in natural watercourses on or adjacent to the site. Any water accumulating in trenches or other excavations shall be removed by pumping or by other approved methods.

C. Pipe fine grading:

1. Schedule fine grading material as specified in this Section.

2. For pipes 16 inches in nominal diameter and under.

a. Place 4 inches of fine grading material below bottom of pipe.
b. Place fine grading material at uniform density, with minimum possible compaction.

3. For pipe over 16 inches in diameter:

a. Place 4 inches, or 1/12 the outside diameter of pipe, whichever is greater, of fine grading material below bottom of pipe.
b. Place fine grading material at uniform density, with minimum possible compaction.

4. Bell or coupling holes:

a. Dig holes after trench bottom has been graded.
b. Provide holes of sufficient width to provide ample room for grouting, banding, or welding.
c. Excavate holes only as necessary for making joints and to ensure that pipe rests upon prepared trench bottom and not supported by any portion of the joint.

5. Depressions for joints, other than bell-and-spigot:

a. Make in accordance with recommendations of joint manufacturer for particular joint used.

D. Pipe bedding:

1. Schedule bedding material as specified in this Section.

2. After pipe laid:

a. Place bedding material under and around pipe in 6 inch maximum lifts of bedding material, to level 12 inches above top of pipe. Compact to 90 percent of maximum density.

3. Pipe displacement:

a. Take necessary precautions in placement and compaction of bedding material to prevent displacement of piping.
b. In event there is movement or floating of the piping, re-excavate, re-lay, and backfill the pipe.

E. Trench backfill above pipe bedding, electrical and control conduit bedding, and electrical and control duct banks:

1. Schedule trench backfill as specified in this Section with the following exceptions:

a. Under structures:
   1) Backfill trench up to underside of structure with controlled low-strength material as specified in this Section under 2.1B – Flowable Backfill / Controlled Low Strength Material (CLSM).

2. Minimum compaction requirements:

   a. Aggregate base course material: 95 percent of maximum density.
   b. Select material: 95 percent of maximum density.
   c. Native material: 90 percent of maximum density.

F. Under existing intersecting pipes or conduits larger than 3 inches in diameter:

1. Backfill from bottom of new pipe trench to spring line of intersecting pipe or conduit with controlled low-strength material as specified in this Section under 2.1B – Flowable Backfill / Controlled Low Strength Material (CLSM).

2. Extend controlled low-strength material as specified in this Section under 2.1B – Flowable Backfill / Controlled Low Strength Material (CLSM). two feet on either side of intersecting pipe or conduit to ensure that material remains in place while other backfill is being placed.

3. Backfill remainder of trench as specified in "Trench backfill above pipe bedding, electrical and control conduit bedding, and electrical and control duct banks" above.

G. Compaction:

1. Methods of compaction and the equipment used shall be appropriate for the material to be compacted and shall not transmit damaging shocks to the pipe, conduit, or duct bank. Compaction using an excavator bucket will not be allowed.

2. Each lift of granular embedment material shall be vibrated with a mechanical probe type vibrator during placement to ensure that all spaces beneath the pipe, conduit, or duct bank are filled.

3. Each lift of granular embedment material shall be compacted with a platform type vibrating compactor to the density specified herein.

4. Each lift of granular backfill material shall be compacted with a vibratory roller or platform vibrator to the density specified herein.

5. In-place density of compacted trench backfill, and bedding determined in accordance with ASTM D1556, or with ASTM D6938.

6. Maximum density obtained in laboratory when tested in accordance with ASTM D1557.

7. Consolidation:

   a. Do not use water settling methods such as flooding, poling, or jetting.

H. Excess material:

1. Remove excess excavated material from the Project.

3.3 FIELD QUALITY CONTROL

A. Tests:

1. Confirmation tests:

a. Contractor's responsibilities:
1) Accomplish specified compaction of trench backfill.
2) Control operations by confirmation tests to verify and confirm that compaction work complies, and is complying at all times, with requirements specified in this Section concerning compaction, control, and testing.
3) Cost of confirmation tests: Paid for by the Contractor.
4) Qualifications of Contractor's testing laboratory: Acceptable to Engineer. Provide lab certification.
5) Copies of confirmation test reports: Submit promptly to the Engineer.

b. Frequency of confirmation testing:
1) Perform testing not less than as follows:
a) For trenches: At each test location include tests for each type or class of backfill from bedding to finish grade.
b) In open fields: 2 every 1,000 linear feet.
c) Along dirt or gravel road or off traveled right-of-way: 2 every 500 linear feet.
d) Crossing paved roads: 2 locations along each crossing.
e) Under pavement cuts or within 2 feet of pavement edges: 1 location every 400 linear feet.

2. Compliance tests:

a. Frequency of testing: Periodic compliance tests will be made by the Engineer to verify that compaction is meeting requirements previously specified.
b. If compaction fails to meet specified requirements: Perform remedial work by one of the following methods:
1) Remove and replace backfill at proper density.
2) Bring density up to specified level by other means acceptable to the Engineer.

3. Retesting:

a. Costs of retesting: Contractor is responsible for the costs of retesting required to confirm and verify that remedial work has brought compaction within specified requirements.
b. Contractor's confirmation tests during performance of remedial work:
1) Performance: Perform tests in manner acceptable to the Engineer.
2) Frequency: Double amount specified for initial confirmation tests.

B. Piping system testing:

1. Alignment, grade and visible defects shall be checked as follows:

    a. Visual internal inspection
        1) Contractor shall clean pipe of excess mortar, joint sealant and other dirt and debris prior to inspection.
        2) Sewer will be insoected by flashing a light between manholes and/or by physical passage to determine the presence of any misaligned, displaced, or broken pipe and other defects.

    b. Television inspection: Sewer line installations shall be inspected by closed circuite television at the Contractor's expence.

3.4 SCHEDULES

A. For trenches located below the top of the natural impervious blanket, use the following for fine grading, bedding, and backfill materials:

1. Controlled low strength material (flowable backfill) as specified in this Section under 2.1B – Flowable Backfill / Controlled Low Strength Material (CLSM).

2. Controlled earth fill consisting of one of the following cohesive materials:

    a. CL: Lean clay, lean clay with sand, and sandy lean clay.
    b. ML: Silt, silt with sand, and sandy silt.
    c. CH: Fat clay with sand, and/or sandy fat clay.

B. For trenches located above the top of the natural impervious blanket:

1. Pipe fine grading materials:

    a. Fine grading material shall be the same as bedding material.

2. Bedding materials:

    a. Pipes:
        1) For pipe less than 16-inch nominal size: Except as otherwise specified, use sand or aggregate base course material.
        2) For pipe from 16- inch to 48-inch nominal size: Except as otherwise specified, use sand or aggregate base course material.
        3) For pipe over 48 inches: Aggregate base course material.
        4) For polyvinyl chloride or other plastic pipe less than 2 inches in diameter: Sand.

    b. Direct buried electrical and control conduits: Sand.

3. Backfill materials:

    a. Beneath public roadways and paved streets:
        1) Backfill trench to underside of pavement with aggregate base course material as specified in this Section under 2.1A – Soil and Rock Materials.

b. Beneath other paved areas (excluding public roadways) or storage areas:
   1) Backfill trench up to within 2 feet of finish grade with select material as specified in this Section under 2.1A – Soil and Rock Materials.
   2) Then backfill from 2 feet below finish grade to finish grade, or underside of aggregate base course or pavement as indicated on the Drawings with aggregate base course material as specified in this Section under 2.1A – Soil and Rock Materials.

c. In areas outside the improved section of roadways or in open country:
   1) Backfill to finish grade with native material as specified in this Section under 2.1A – Soil and Rock Materials.

d. Through earth slopes adjacent to, or supporting structures:
   1) Backfill to finish grade with aggregate base course material or select material.

END OF SECTION

SECTION 02260 – EXCAVATION SUPPORT AND PROTECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes: Requirements for designing, providing, maintaining, and removing excavation support and protection.

1.2 REFERENCES

A. American Society of Civil Engineers (ASCE):

1. Guidelines of Engineering Practice for Braced and Tied-Back Excavations.

B. U.S. Army Corps of Engineers (USACE):

1. Guidance for Work Proposed Near or Within a Federally Constructed Flood Control Project.

2. Related USACE guidance documents and permit conditions.

C. Department of the Navy Naval Facilities Engineering Command (NAVFAC):

1. Design Manual 7.2 - Foundations and Earth Structures.

2. Design Manual 7.3 - Soil Dynamics and Special Design Aspects.

D. United States Steel Corporation (USS):

1. Steel Sheet Piling Design Manual.

1.3 DEFINITIONS

A. General Engineering Design Practice: General engineering design practice in area of the Project, performed in accordance with recent engineering literature on subject of shoring and stability of excavations.

B. Shoring: A temporary structural system designed to support vertical faces, or nearly vertical faces, of soil or rock for purposes of excavation. Shoring includes, internally braced sheet piling, slurry walls, soldier piles and lagging, and other similar shoring systems. Sloping of the soil is not shoring.

C. Support levels: Level of tiebacks, wales, rackers, bottom of excavation, and other types of support.

1.4 SYSTEM DESCRIPTION

A. Where General Engineering Design Practice is specified, provide drawings and calculations that are performed and signed by civil or structural engineer registered in State where Project is located:

1. Clearly disclose assumptions made, criteria followed, and stress values used for materials being used in design calculations.

2. Submit list of references acceptable to Engineer that substantiating appropriateness of design assumptions, criteria, and stress values.

B. Design requirements:

1. All earthwork shall comply with requirements for projects within the critical zone of a federally constructed flood project.

2. General:

a. All excavations and related earthwork shall comply with USACE documents, guidance and permits related to construction in a levee zone.
b. Dewatering:
   1) Dewater soil inside shoring as specified in Section 02240 - Dewatering.
   2) Do not lower groundwater outside of shoring more than 1 foot.
   3) Recharge groundwater outside shoring to limit groundwater draw down outside of shoring to amount specified above.

c. When electing to design with material stresses for temporary construction higher than allowable stresses prescribed in building code as specified in Section 01410 - Regulatory Requirements, increase in such stresses shall not exceed 10 percent of value of prescribed stresses.
d. Minimum safety factor used for design shall not be less than 1.5.
e. The calculated minimum depth of penetration of shoring below bottom of excavation shall be increased not less than 30 percent if full value of allowable passive pressure is used in design.
f. Maximum height of cantilever shoring above bottom of excavation shall not exceed 15 feet. Use braced shoring when height of shoring above bottom of excavation exceeds 15 feet.
g. The location of point of fixity for shoring shall not be less than half calculated minimum embedment depth below bottom of excavation.
h. Generally acceptable references for design of shoring and excavations are as follows:
   1) ASCE Guidelines of Engineering Practice for Braced and Tied-Back Excavations.
   2) NAVFAC Design Manual 7.2.
   3) NAVFAC Design Manual 7.3.
   4) USS Steel Sheet Piling Design Manual.
   5) USACE EM 1110-2-2504 - Design of Sheet Pile Walls.

3. Soldier piles and lagging:

a. Provide lagging over full face of excavation. Joints between pieces of lagging shall be tight to prevent loss of soil.
b. Provide full face lagging all around penetrations through lagging.
c. If the soldier piles are installed in predrilled holes and are not concrete encased, fill predrilled holes with controlled low strength material as specified in Section 02312 - Controlled Low Strength Material (CLSM) after soldiers piles are installed.
d. Assumed effective width for passive soil resistance:
    1) Effective width of driven soldier piles shall not exceed 2 times width of pile.
    2) Effective width of CLSM encased soldier piles in drilled holes shall not exceed 2 times width of pile.
    3) Effective width of concrete encased soldier piles shall not exceed 2 times width of concrete encasement.
e. Fill voids behind lagging with gravel or other material acceptable to Engineer.
f. Apply loads from tie back soil, rock, or deadman anchors concentrically to soldier piles or wales spanning between soldier piles:
    1) Wales shall be back-to-back double channels or other members acceptable to Engineer.
    2) Do not eccentrically load structural section of soldier piles or wales.
g. Design soldier piles for downward loads including vertical loads from tieback anchors.

4. Soil anchors, rock anchors, and deadman anchors:

a. Design tieback anchors for a safety factor of not less than 2 times calculated load from shoring.
b. Proof load all production anchors to 130 percent of calculated load from shoring.
c. Lock off production anchors at calculated load from shoring.
d. Length of soil anchors used to calculate resistance to load from shoring shall not include any length within potential active pressure soil failure zone behind face of shoring.
e. Design tie rods for tieback anchors for 130 percent of calculated load from shoring.
f. Design tie rods for tieback anchors for 150 percent of the calculated load from shoring when tie rod couplers are used and for other conditions where stress concentrations can develop.

5. Set inside face of shoring back from structure not less than greater of following:

a. 5 feet from face of wall.
b. 2 foot 6 inches from edge of foundation.
c. Depth of excavation below bottom of foundation.

C. Pile Installation Requirements:

1. Due to the existence of a significant depth of unstable sands with potential for large settlement and subsidence/liquefaction, the driving via conventional methods or the installation via vibrating methods of HP and steel sheet piles shall be approved by the ENGINEER. If conventional methods are not feasible, steel HP piles if used shall be inserted (not driven) into prebored holes. If these piles are used as soldier piles, a sufficient

depth of the shaft shall be filled with controlled low strength material or concrete. As an alternative, concrete auger cast soldier piles may be used in lieu of the prebored HP piles.

D. Performance requirements:

1. General:

a. Support faces of excavations and protect structures and improvements in vicinity of excavations from damage and loss of function due to settlement or movement of soils, alterations in ground water level caused by such excavations, and related operations.
b. Specified provisions:
1) Complement, but do not substitute or diminish, obligations of Contractor for furnishing of safe place of work pursuant to provisions of the Occupational Safety and Health Act of 1970 and its subsequent amendments and regulations and for protection of Work, structures, and other improvements.
2) Represent minimum requirement for:
a) Number and types of means needed to maintain soil stability.
b) Strength of such required means.
c) Methods and frequency of maintenance and observation of means used for maintaining soil stability.

2. Provide safe and stable excavations by means of sheeting, shoring, bracing, sloping, and other means and procedures, such as draining and recharging groundwater and routing and disposing of surface runoff, required to maintain stability of soils and rock.

3. Provide support for trench excavations for protection of workers from hazard of caving ground.

4. Provide shoring:

a. Where, as result of excavation work and analysis performed pursuant to general engineering design practice, as defined in this Section:
1) Excavated face or surrounding soil mass may be subject to slides, caving, or other types of failures.
2) Stability and integrity of structures and other improvements may be compromised by settlement or movement of soils, or changes in soil load on structures and other improvements.

b. For trenches 5 feet and deeper.
c. For trenches less than 5 feet in depth, when there is potential for cave-in.
d. Where indicated on the Drawings.

5. For safe and stable excavations, use appropriate design, construction, and maintenance procedures to minimize settlement of supported ground and to prevent damage to structures and other improvements, including:

a. Using stiff shoring systems.
b. Following appropriate construction sequence.
c. Using shoring system that is tight enough to prevent soil loss through the shoring.

d. Using shoring system that extends far enough below bottom of excavation to prevent piping, heave, or flow of soil under shoring.
e. Design for safety factor of not less than 1.50.
f. Providing surface runoff routing and discharge away from excavations.
g. Where dewatering inside shoring is necessary, recharge groundwater outside shoring as necessary to prevent settlement in area surrounding shored excavation.
h. Where sheet piling is used, use interlocking type sheets:
    1) Sheet piles shall be continuous and driven in interlock.
    2) If bottom of the excavation is located below the water table, use “ball and socket” or "thumb and finger" type interlock.

i. Not applying shoring loads to existing structures and other improvements.
j. Not changing existing soil loading on existing structures and other improvements.
k. Provide welded steel packing between soil retaining members such as sheet piles and wales and similar members when gap exceeds 1/4 inch before wales are loaded.

1.5 SUBMITTALS

A. Shop drawings and calculations:

1. Calculations for different load, support, and other conditions that occur during the sequence of installation of shoring, construction of facilities protected by shoring, and sequence of removal of shoring.

2. Sketches showing the condition at various stages of installation and removal of shoring.

3. Show on plan shoring, structures, pipelines, and other improvements located near shoring.

4. When utilities penetrate shoring, show location of penetrations on elevation of all sides of shoring.

5. Show details for ground support and sealing around utility penetrations.

6. Indicate method used for installing driven shoring.

B. Written geotechnical report with soil characteristics and design recommendations.

C. Control points and schedule of measurements:

1. Submit location and details of control points and method and schedule of measurements.

2. Survey data.

D. Detailed sequence of installation and removal of shoring:

1. Consider effects of ground settlement in sequence of installation and removal of shoring.

2. Provide sketches showing conditions at various stages in sequence of installation and removal of shoring.

E. Submit submittals for excavation support and protection as complete package and include all items required in this Section:

1. Incomplete submittals will not be reviewed and will be returned for resubmittal as complete package.

F. Submit dewatering submittals as specified in Section 02240 - Dewatering for Structures with submittals for excavation support and protection.

1.6 SEQUENCING

A. Do not begin construction of any shoring or excavation operations until:

1. Submittals for shoring and dewatering have been accepted.

2. Control points as specified in this Section and on existing structures and other improvements as indicated on the Drawings have been established and surveyed to document initial elevations and locations.

3. Materials necessary for installation are on site.

B. Submit submittals minimum of 60 days prior to scheduled date to begin excavation work.

PART 2 - PRODUCTS - Not Used.

PART 3 - EXECUTION

3.1 CONSTRUCTION

A. Installation of shoring:

1. Install means for providing safe and stable excavations as indicated in submittals.

B. Removal of shoring:

1. Except for concrete encased soldier piles, slurry walls, and similar shoring systems, remove shoring by completion of Work.

2. Select shoring system and method of removal, which will minimize soil that sticks to shoring from creating voids and causing settlement.

3. To prevent settlement caused by pulling shoring, fill voids with pressure injected grout:

a. Inject grout starting at bottom of void and progressively fill void to grade.
b. Minimize length of shoring removed ahead of grouting operation and limit time void is left ungrouted to prevent void from closing up before being grouted.

4. Pressure preservative treated wood lagging may be left in place if acceptable to Engineer.

C. Control points:

1. Establish control points on shoring and on structures and other improvements in vicinity of excavation for measurement of horizontal and vertical movement:

a. Set control points on shoring support system:
1) Set points at distances not exceeding 25 feet at each support level.
2) Promptly upon completion of construction of control points survey control points. Submit copy of field notes with measurement.
3) Perform horizontal and vertical survey and measurement of control points at least once every week.
a) Field notes shall show current measurement and change in measurement from first measurement taken.
4) Set control points on corners of existing structures and on curbs, manholes, and other improvements at the locations indicated on the Drawings.
5) Provide plumb bobs with horizontal targets indicating original position of plumb bobs in relation to shoring at control points.

D. Maintenance:

1. Where loss of soil occurs, plug gap in shoring and replace lost soil with fill material acceptable to Engineer.

2. Where measurements and observations indicate possibility of failure or excessive movement of excavation support, determined in accordance with general engineering design practice, take appropriate action immediately.

PART 4 - SPECIAL REQUIREMENTS FOR EARTHWORK WITHIN CRITICAL AREA OF A FLOOD CONTROL PROJECT

4.1 EXCAVATIONS WITHIN CRITICAL BUT BEYOND LEVEE SLOPES (CRITICAL AREA IS DEFINED AS WITHIN 500 FEET LANDWARD FROM CENTERLINE OF LEVEE.)

A. Excavations adjacent to the levees within the limits of the levee-projected slope should be sloped no steeper than 1V on 1H from the bottom of the excavation. The minimum bench width should be at least equal to the depth of the lower portion of the slope. Deeper excavations, exceeding 12 feet in depth, may require a stability analysis that may indicate other slope or bench configurations may suffice or may be required.

B. Excavation utilizing sheeting and bracing or trench boxes requires a design analysis for the excavation support system. Materials in areas outside of the sheeting and bracing showing evidence of distress must be removed, backfilled, and recompacted.

C. Excavation in the critical area shall not be performed between April 1 and August 1 of any year without obtaining a written waiver from the U.S. Army Corps of Engineers (USACE). CONTRACTOR shall be solely responsible for obtaining the waiver from the USACE and shall comply with the waiver conditions. Under no circumstance will City be subject to any damages

for project delay as a result of the critical area. A waiver request to the USACE must include a contingency plan for high river stages in conformance with current USACE guidance. Any work which may weaken a flood protection structure shall be performed in an expedited manner to minimize the length of time that the structure is weakened. Complete backfill of the excavated area and bulkheading of any drainage structures or other outfalls will be required within 24 hours if flood stages are forecast. Further USACE's restrictions may be required as a condition of the waiver.

D. Before construction activities are initiated, CONTRACTOR shall determine the actual groundwater levels at the site and whether dewatering will be utilized. Design and construction of the dewatering system shall conform to the current USACE's guidance, in particular, TM 5-818-5/AFM 88-S, Chap 6, Dewatering and Groundwater Control.

4.2 ADDITIONAL USACE REQUIREMENTS

A. CONTRACTOR'S compliance with all applicable USACE's requirements for excavation and earthwork within the critical area of the Missouri River Levee is expressly included within these contract documents, contained in Part 4.0 of this specification and the USACE's five page document, entitled "Excavation and Backfill", incorporated herein by reference. It is agreed that City shall not be subject to any claims for additional payment in excess of the contract (bid) amount for any special construction methods, procedures, or materials necessary to comply with USACE's requirements such as emergency backfilling. It is further agreed that City shall not be subject to any claim for damages for delay as a result of the USACE. or the local levy district's restrictions on the timing of excavations, emergency backfilling, or utilizing special construction methods, procedures, or materials. CONTRACTOR'S sole and exclusive remedy is to submit to City a request for extension in Contract Times for delays in critical path activities the direct result of the USACE or the local levee district's requirements in the event of a potential flood condition or to avoid impairment of the levee.

END OF SECTION

SECTION 02514 – CONCRETE PAVING

PART 1 - GENERAL

1.1 SCOPE.

A. This section covers the furnishing of labor, materials, and equipment for the construction of portland cement concrete pavements for roadway and parking areas as indicated on the Drawings.

1.2 GENERAL.

A. Concrete pavement shall be constructed to the lines, grades and cross sections indicated on the Drawings.

B. Governing Standards.

1. Except as otherwise specified or indicated, materials, equipment, details, and construction methods shall comply with AASHTO and Kansas City Metropolitan Chapter of American Public Works Association Standards.

C. Coordination.

1. Contractor shall coordinate the construction of concrete paving with excavation, the construction of concrete curb and gutters and other construction.

1.3 SUBMITTALS.

A. All submittals of drawings and data, reinforcement bar lists and placement drawings, test data, design mixture reports, field test reports, catalog data sheets; and other data shall be in accordance with the Submittals Procedures section, unless otherwise specified herein.

B. Contractor shall provide certifications for:

1. Cement

2. Admixtures

3. Membrane curing compound.

PART 2 - PRODUCTS

2.1 MATERIALS.

A. Except as modified herein, materials shall conform to the requirements of the governing standard. The source of materials shall be acceptable to the Engineer.

Jointing materials	Hot-poured Polymeric Asphalt Based Hot-poured elastic joint sealer Preformed fiber expansion joint filler Preformed Polychloroprene Elastromeric
Reinforcing steel	Deformed bars
Air entraining mixture	Permitted
Water – Reducer/plasticizer	Permitted
Water – Reducer/retarder admixture	Permitted
Accelerator	Permitted
Acceptable curing material	Liquid membrane curing compound

2.2 CONCRETE MIXTURE REQUIREMENTS

Concrete mix designation	658-1-2-0.365	
Minimum 28 days compressive strength	4,500	Psi
Minimum cement content	658	lbs
Acceptable cementitious materials	Slag	
Maximum cementitious materials Replacement limitations	15-25%	
Water/cementitious material ratio	0.365	
Consistency (slump)	2	In
Max Water content	240	lbs
Max. Air content	7.0	%

2.3 LIMITING REQUIREMENTS.

A. Concrete materials shall be selected, and concrete shall be proportioned, batched, mixed, and delivered in a manner that will minimize shrinkage and cracking.

PART 3 - EXECUTION

3.1 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.

3.2 PORTLAND CEMENT CONCRETE PAVEMENT.

A. Unless otherwise specified, the new pavement shall be constructed to the configuration, and to the lines and grades indicated on the Drawings.

B. The concrete shall be placed on the subgrade to the required depth and width of the construction lane in successive batches and in a continuous operation. The concrete shall be placed as uniformly as possible to minimize the amount of additional spreading necessary. Concrete shall be placed, vibrated, and finished as specified in the governing standard.

C. Forms.

1. All forms shall be in good condition, clean, and free from imperfections. Forms shall be in conformance with the Governing Standard.

D. 3-2.02. Reinforcement Placement.

1. Reinforcement shall be placed as indicated on the Drawings and in conformance with the governing standard.

E. Repair of Epoxy Coating. Not used.

F. Curing and Protection.

1. The finished concrete shall be cured and protected as specified in accordance with governing standard.

2. Traffic shall not be allowed on the newly constructed pavement until it has attained the strength requirements specified in the governing standard, or as otherwise stipulated herein.

G. Temperature Requirements.

1. Temperature requirements relating to concrete work shall be in accordance with the governing standard.

3.3 JOINTS.

A. Joints generally shall be formed at right angles to the true alignment of the pavement and to the depths and configuration specified by the Governing Standard or as modified by the Drawings and Specifications.

B. Expansion, contraction, transverse construction, and longitudinal pavement joints shall be constructed at the locations indicated on the Drawings.

C. All joints shall be sealed with an approved joint sealer applied in accordance with the manufacturer's directions within a time frame as indicated by the Governing Standard.

3.4 BACKFILL.

A. The time lapse for form removal and backfilling shall be in accordance with the Governing Standard.

3.5 City'S FIELD CONTROL TESTING.

A. Field control testing shall be performed in accordance with the requirements specified herein.

B. Field control tests, including slump, air content, and making compression test cylinders, will be performed by testing laboratory personnel. Contractor shall provide all facilities and the services of one or more employees as necessary to assist with the field control testing.

C. As stipulated in the Quality Control section, tests required during the progress of the work shall be made at the expense of City.

D. The frequency specified herein for each field control test is approximate and subject to change by Engineer.

E. Engineer may require field testing prior to the addition of superplasticizer at the site to determine compliance with the specifications. Field testing after the addition of superplasticizer shall be conducted as specified and as needed to determine that the concrete is in compliance with the specifications. Air tests shall be conducted whenever field tests are conducted.

F. Slump.

1. A slump test shall be made for each 50 cubic yards of concrete. Slump shall be determined in accordance with AASHTO T119 (ASTM C143).

G. Air Content.

1. An air content test shall be made on concrete from one of the first three batches mixed each day and on concrete from each batch of concrete from which concrete compression test

cylinders are made. Air content shall be determined in accordance with AASHTO T152 (ASTM C231) and verified in accordance with ASTM C138.

H. Unit Weight.

1. A unit weight test shall be made on concrete from each batch of concrete from which concrete compression test cylinders are made. Unit weight shall be determined in accordance with ASTM C138.

I. Concrete Temperature.

1. A concrete temperature test shall be made on concrete from the first batch of concrete mixed each day and on concrete from each batch of concrete from which concrete compression test cylinders are made. Concrete temperature shall be determined in accordance with ASTM C1064.

J. Water-Soluble Chloride Ion.

1. Water-soluble chloride ion testing shall be performed in accordance with ASTM C1218/AASHTO T260.

K. Compression Tests.

1. One set of four concrete compression test cylinders shall be made each day when 25 to 50 cubic yards of concrete is

2. placed. One additional set of test cylinders shall be made from each additional 50 cubic yards, or major fraction thereof, placed in any one day. One cylinder of each set shall be tested at an age of 7 days and two cylinders of each set shall be tested at an age of 28 days. The other cylinder of each set shall be tested as directed by the Engineer.

3. Test cylinders shall be 6 inches in diameter by 12 inches high and shall be made, cured, stored, and delivered to the laboratory in accordance with AASHTO T23 (ASTM C31) and tested in accordance with AASHTO T22 (ASTM C39).

4. Each set of compression test cylinders shall be marked or tagged with the date and time of day the cylinders were made, the location in the work where the concrete represented by the cylinders was placed, the number of the delivery truck or batch, the air content, the slump, the unit weight, and the concrete temperature.

L. Test Reports.

1. Five copies of each test report shall be prepared and distributed by the testing laboratory to the Resident Project Representative (two copies), Engineer, City, and Contractor, in accordance with the Quality Control section

3.6 EVALUATION AND ACCEPTANCE OF CONCRETE PAVEMENT.

1. Concrete pavement will be evaluated for compliance with all requirements of the specifications. Concrete strength criteria will be used for evaluation and acceptance of the concrete. The results of all tests performed on the concrete and other data and information concerning the procedures for handling, placing, and curing concrete will be used to evaluate the concrete for compliance with the specified requirements.

B. Compression Test Evaluation.

1. Compressive strength test results will be evaluated for compliance with the specified strength requirements and the specified requirements that relate to durability.

C. Strength.

1. The strength level of the concrete will be considered satisfactory when the averages of all sets of three consecutive strength tests equal or exceed the specified compressive strength, f'_c, and no individual strength test result falls below the specified compressive strength by more than 500 psi.

End of Section

SECTION 02522 – CONCRETE SIDEWALK, CURBS, AND GUTTERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes: Concrete curbs, gutters, sidewalks, driveways, access ramps, and alley intersections.

1.2 SYSTEM DESCRIPTION

A. Performance requirements: Construct various types of concrete curb, gutter, sidewalk, driveways and intersections to dimensions and details indicated on the Drawings.

1.3 SUBMITTALS

A. Product data: Submit data completely describing products.

B. Samples: Submit samples when requested.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Concrete: Class A, as specified in Section 03300 - Cast-In-Place Concrete.

B. Curb finishing mortar: 1 part portland cement to 2 parts sand.

C. Form release material: Light oil or other releasing agent of type which does not discolor concrete or interfere with the application of finishing mortar to curb tops and faces.

D. Joint materials:

1. Expansion: As specified in Section 03150 - Concrete Accessories.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions:

1. Verify field conditions, including subgrade condition and interferences, before beginning construction.

3.2 PREPARATION

A. Surface preparation:

1. Subgrade:

a. Construct and compact true to grades and lines indicated on the Drawings and requirements as specified Section 02050 - Soils and Aggregates for Earthwork.
b. Remove soft or unsuitable material to depth of not less than 6 inches below subgrade elevation and replace with satisfactory material.

2. Forms and subgrade: Water immediately in advance of placing concrete.

3.3 INSTALLATION

A. Special techniques:

1. Contractor's option:

a. Construct concrete curbs and gutters by conventional use of forms, or by means of curb and gutter machine when acceptable to the Engineer.
b. When use of machines designed specifically for work of this Section are accepted by the Engineer, results must be equal to or better than those produced by use of forms.
c. Applicable requirements of construction that apply to use of forms also apply to use of machines.
d. Discontinue use of machines when results are not satisfactory to the Engineer.

B. Forms:

1. Carefully set to line and grade and securely stake in position forms conforming to dimensions of items to be constructed.

2. Thoroughly clean prior to each use and coat with form releasing material.

C. Expansion and weakened-plane joints:

1. Expansion joints:

a. Construct vertically, and at right angles to centerline of street and match joints in adjacent pavement or sidewalks.
b. Constructed at radius points, driveways, alley entrances, and at adjoining structures.
c. Fill joints with expansion joint filler material.

2. Weakened-plane joints:

a. Construct as indicated on the Drawings.
b. Match joint locations and details in adjacent curbs, gutters, and sidewalks.

D. Concrete:

1. Placing:

a. Thoroughly spade concrete away from forms so that no rock pockets exist next to forms and so that no coarse aggregate will show when forms are removed.

2. Compacting:

a. Compact by mechanical vibrators accepted by the Engineer.
b. Continue tamping or vibrating until mortar flushes to surface and coarse aggregate is below concrete surface.

3. Form removal:

a. Front form faces: Do not remove before concrete has taken initial set and has sufficient strength to carry its own weight.
b. Gutter and rear forms: Do not remove until concrete has hardened sufficiently to prevent damage to edges. Take special care to prevent damage.

4. Finishing and curing: Comply with requirements as specified in Section 03300 - Cast-In-Place Concrete except as modified here:

a. As soon as curb face forms are stripped, apply finishing mortar to the top and face of curb and trowel to a smooth, even finish. Finish with fine haired broom in direction of work.
b. Where curb is installed without integral gutter, extend finish 2 inches below grade.
c. Edge concrete at expansion joints to 1/4 inch radius.
d. Flow lines of gutters shall be troweled smooth 4 inches out from curb face for integral curb and gutter and 4 inches on both sides of flowline for gutters without curbs.
e. Sidewalks and ramps: Broom finish.

E. Backfilling:

1. Unless otherwise specified, backfill behind curbs, gutters, or sidewalks with soil native to area and to lines and grades indicated on the Drawings.

3.4 FIELD QUALITY CONTROL

A. Tests:

1. Curbs and gutters:

a. Test face, top, back, and flow line with 10 foot straightedge or curve template longitudinally along surface.

2. Correct deviations in excess of 1/4 inch.

3. Gutters:

   a. Frequency of testing: When required by the Engineer, where gutters have slope of 0.8 foot per 100 feet or less, or where unusual or special conditions cast doubt on capability of gutters to drain.
   b. Test method: Establish flow in length of gutter to be tested by supplying water from hydrant, tank truck, or other source.
   c. Required results:
      1) 1 hour after supply of water is shut off, inspect gutter for evidence of ponding or improper shape.
      2) In event water is found ponded in gutter to depth greater than 1/2 inch, or on adjacent asphalt pavement, correct defect or defects in manner acceptable to the Engineer without additional cost to the Contract.

3.5 ADJUSTING

A. Repair portions of concrete damaged while stripping forms or, when damage is severe, replace such work at no additional cost to the Contract. Evidence of repairs shall not be noticeable in the finished product.

B. Remove and replace sections of work deficient in depth or not conforming to requirements indicated on the Drawings and specified in the Specifications at no additional cost to the Contract. Removal and replacement shall be the complete section between 2 joints.

END OF SECTION

SECTION 02624 – POLYVINYL CHLORIDE (PVC) GRAVITY SEWER PIPE

PART 1 - GENERAL

1.01 SUMMARY

A. This section covers all work, materials and testing for the installation of PVC gravity sewer pipe by the open-cut method as shown on the Drawings and in conformity with these specifications. All pipelines shall be constructed to proper line and grade as shown on the Drawings and shall result in an unobstructed, smooth and uniform conduit.

B. This section does not cover PVC pipe associated with pipe bursting. See Section 02580 – Pipe Bursting for Gravity Sewers.

1.02 SPECIFICATION MODIFICATIONS

A. It is understood that throughout this section these Specifications may be modified by appropriate items in Section 01015 – Specific Project Requirements or as otherwise indicated on the Drawings.

1.03 RELATED SECTIONS

A. Section 01015 – Specific Project Requirements.
B. Section 01300 – Submittals.
C. Section 02250 – Trenching, Pipe Embedment and Backfill.
D. Section 02580 – Pipe Bursting for Gravity Sewers.
E. Section 02702 – Sewer Pipe and Manhole Testing.

1.04 CODES AND STANDARDS

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

B. American Society for Testing and Materials (ASTM):
   1. D2321 – Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
   2. D2412 – Standard Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading.
   3. D3034 – Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
   4. D3212 – Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.
   5. F477 – Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
   6. F679 – Standard Specification for Type PSM Poly Vinyl Chloride (PVC).

1.05 SUBMITTALS

A. Submit as specified in Section 01300 – Submittals.
B. Shop Drawings and Laying Schedule as required by City/Design Professional.
C. Product Data:
   1. Submit manufacturer's product data for all pipe, fittings and accessories to be used.
   2. Manufacturer's report of the test results.

3. A manufacturer's certification shall be submitted indicating that the pipe and fittings were manufactured, sampled, tested and inspected in accordance with this specification and meet the minimum requirements. Each certification furnished shall be signed by an authorized agent of the manufacturer.

1.06 QUALITY ASSURANCE

A. The Contractor is responsible for the quality assurance and quality control of the Work.
B. Manufacturer:
   1. Certification of the minimum experience requirements. A minimum of five (5) years' experience in the design, manufacture and commercial supplying of the size and type of piping and fittings specified for the project.
   2. Inspection and testing shall be performed by the Manufacturer's quality control personnel in conformance with all applicable standards. Testing may be witnessed by City, Design Professional or approved independent testing laboratory. The Contractor shall provide certified test reports indicating that materials conform to these specifications.

1.07 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Inspect all materials delivered to the site for damage. Damaged pipe shall be replaced at no additional cost to the City.
B. Store materials (piping, jointing materials, rubber gaskets, etc…) with the minimum amount of handling possible. Store materials on site in enclosures or under protective coverings out of direct sunlight. Do not store materials directly on the ground.
C. Keep the interior of pipes and fittings free of dirt and debris.
D. Handle pipe, fittings and other accessories in such manner as to ensure delivery to the trench in a sound, undamaged condition. Hand carry, use slings or other approved devices designed to protect the pipe (do not drag pipe) when moving the materials.

PART 2 - PRODUCTS

2.01 REQUIREMENTS

1. Furnish pipe materials, joint types, sizes and strength classes as indicated and specified by the contract documents. The pipe shall be made of PVC plastic having a cell classification of 12454 or 12364 as defined in ASTM D1784.
2. Higher strengths Materials: may be furnished at the Contractor's option at no additional cost to the City.

2.02 PIPE, FITTINGS, JOINTS, COATINGS

A. Pipes and fittings eight (8) inches through fifteen (15) inches in diameter shall conform to ASTM D3034 except as otherwise specified herein.
   1. The minimum pipe wall thickness shall be as shown in Table 1 unless a thicker wall is noted in the contract documents.
   2. Color for pipe and fittings shall be green.
   3. Furnish maximum pipe length normally produced by the manufacturer. Fittings, closures and specials shall be as specified in the contract documents.
   4. All pipe shall have an integral bell and spigot joint.

5. Joints shall conform to ASTM D3212. Joints shall be push-on type only with the bell-end grooved to receive a gasket.

Table 1. Minimum Pipe Wall Thickness for Pipes 8 inches through 15 inches in Diameter

Depth of Pipe Cover (feet)	Pipe SDR
Less than or equal to 15 feet	26
15 to 30 feet	21
Greater than 30 feet	PVC pipe is not allowed

6. PVC pipe shall contain the markings required by ASTM D3034.
7. The spigot end of the pipe shall be marked with a reference line to facilitate assembly and installation inspection.
8. Elastomeric seals (gaskets) shall conform to ASTM F477. Natural rubber gaskets shall not be used.
9. Fittings (tee or wye connections) suitable for four (4) inch and six (6) inch sanitary service lines shall be bell-end with a minimum wall thickness conforming to SDR 26 unless a thicker wall is noted in the contract documents.
10. A special design is required for sanitary service connections 8 inches and larger. Special designs shall conform to the contract documents.
11. Saddle connections are not be allowed for sanitary sewer service lines.

B. Pipes and fittings eighteen (18) inches through (60) inches in diameter shall conform to ASTM F679 except as otherwise specified in the contract documents.
1. Furnish maximum pipe length normally produced by the manufacturer. Fittings, closures and specials shall be as specified in the contract documents.
2. Pipe shall have an integral bell and spigot joint to form a water tight seal.
3. Pipe shall have a minimum wall thickness conforming to ASTM F679 (PS115) unless a thicker wall is noted in the contract documents.
4. Joints shall conform to ASTM D3212. Joints shall be push-on type only with the bell-end grooved to receive a gasket.
5. Elastomeric seals (gaskets) shall conform to ASTM F477. Natural rubber gaskets shall not be used.
6. The minimum wall thickness of the fittings shall be the same as the minimum wall thickness of the equivalent size of the pipe for the project, specified in ASTM F679 or as otherwise specified in the contract documents, whichever is greater.
7. The minimum pipe stiffness shall be as specified in ASTM F679 (PS115) when tested at 5% deflection in accordance with Test method D2412.

PART 3 - EXECUTION

3.01 HANDLING

A. Pipe and accessories shall be handled in a manner that will ensure their finished installation keeps the materials in a sound, undamaged condition. Equipment, tools and methods used in loading, unloading, hauling and laying the pipe and fittings shall be such that the material is not damaged.

B. Pipe shall be handled in such a manner that no weight, including the weight of the pipe itself, will bear on or be supported by the spigot end or bell end at any time. Pipe and fittings which have been damaged to any degree will not be accepted and shall be removed from the project site.

3.02 TRENCHING AND BACKFILL.

A. Trenching, backfill, compaction and other efforts related to earthwork shall conform to Section 02250 – Trenching, Pipe Embedment and Backfill.

3.03 PIPE INSTALLATION

A. Install pipe and fittings in accordance with the requirements of ASTM D2321 for laying and joining pipe and fittings.

B. Inspect each pipe and fitting before and after installation; replace those found damaged or defective and remove from the trench and site.

C. Provide proper equipment and tools for lowering sections of pipe into the trench.

D. Lay pipe with the bell ends in the upgrade direction (bells ahead). Adjust spigots in the bells to give a uniform space all around. Blocking or wedging between bells and spigots is not allowed. Replace the pipe or fitting with one of the proper dimensions to allow uniform space for the proper installation of the joint.

E. At the end of each work day, temporarily seal the open ends of the pipe with a manufacturer's watertight plug or cap.

F. Provide batter boards not more than 25 feet apart in trenches for checking and ensuring that pipe invert elevations are as indicated in the contract documents. A laser beam may be used in lieu of batter boards for the same purpose.

G. Pipe shall be protected from lateral displacement by means of granular bedding material as provided in Section 02250 – Trenching, Pipe Embedment and Backfill.

H. Under no circumstances shall pipe be laid in water and no pipe shall be laid in unsuitable weather conditions or unsuitable trench conditions.

I. When the pipe is jointed in the trench, the main shall form a true and smooth line. Pipe shall not be trimmed except for closures. Pipe not providing a good fit shall be removed and replaced.

3.04 ALIGNMENT AND GRADE

A. All pipe shall be laid straight and true between changes in alignment and at a uniform grade between the changes in grade.

B. All lines shall be laid so that each section between manholes will fully lamp.

C. Pipe shall be aligned and constructed to the line and grade as shown on the Drawings.

3.05 JOINTING

A. All instructions and recommendations of the pipe manufacturer, relative to gasket installation and other jointing operations, shall be observed and followed by the Contractor. All joint surfaces shall be heavily lubricated with a vegetable soap solution immediately before the joint is completed.

3.06 CUTTING PIPE

A. Cutting of the pipe shall be done in a neat manner without damage to the pipe.
B. All cutting of pipe shall be done with a mechanical pipe cutter of an approved type by the manufacturer; except in locations where the use of mechanical cutters would be impracticable. Existing pipe may be cut with diamond point chisels, saws or other tools which will cut the pipe without damaging the pipe by impact or shock.
C. Pipe cuts shall be smooth, straight and at right angles to the pipe axis.

3.07 CLEANING

A. The interior of all pipe shall be cleaned of all foreign matter before being installed and shall be kept clean until the work has been accepted. All lumps, blisters and excess coating shall be removed from the exterior surface of the spigot and the interior surface of the bell. Such surfaces shall be brushed, wiped clean, dry and free from dirt, oil and grease before placing the spigot in the bell. All joint contact surfaces shall be kept clean until the jointing is complete.
B. Every precaution shall be taken to prevent foreign material from entering the pipe while it is being installed. No debris, tools, clothing or other materials shall be placed or left in the pipe.
C. Whenever pipe laying is stopped at the end of the work day, the open end(s) of the line shall be sealed with a watertight plug or cap. Whenever a tie-in to the existing collection system is being made, plugs shall be installed to prevent groundwater and debris from entering the collection system and removed just prior to installing the closure.

3.08 FIELD QUALITY CONTROL

A. All pipelines shall be tested in accordance with Section 02702 - Sewer Pipe and Manhole Testing.

END OF SECTION

SECTION 02702 – TESTING REQUIREMENTS FOR SANITARY SEWER: MAINS AND MANHOLES

PART 1 - GENERAL

1.01 SUMMARY

A. This section covers the testing of all sewer mains and manholes. The Contractor shall provide all materials, labor and equipment to complete the testing requirements in accordance with this section. All costs pertaining to testing shall be included in the lump sum bid.

1.02 SPECIFICATION MODIFICATIONS

A. It is understood that throughout this section, these Specifications may be modified by appropriate items in Section 01015 – Specific Project Requirements or as otherwise indicated on the Contract Drawings.

1.03 RELATED SECTIONS

A. Section 01015 – Specific Project Requirements.
B. Section 01300 – Submittals.
C. Section 02687 – Laser Profiling of Sewer Mains.
D. Section 03362 – Manhole Rehabilitation.
E. Section 03370 – Sanitary Sewer Manhole Construction.
F. Section 05010 – Sanitary Sewer Manhole Castings.

1.04 QUALITY ASSURANCE

A. The Contractor is responsible for the quality assurance and quality control of the Work.

1.05 INFORMATION PROVIDED BY THE CITY

A. As provided in the Contract Documents.

1.06 CODES and STANDARDS

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only. The version of the codes and standards in effect at the time of the Notice to Bidders shall be used, except as noted on the Drawings or in the Specific Project Requirements section of these specifications.

B. American Society for Testing and Materials (ASTM):

ASTM C828 – Low-Pressure Air Testing of Vitrified Clay Pipe Lines.

ASTM C969 – Standard Practice for Infiltration and Exfiltration Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines.

ASTM C1244 – Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test.

ASTM F1417 – Installation Acceptance of Plastic Gravity Sewer Lines Using Low-Pressure Air.

C. American Water Works Association (AWWA):

AWWA C600 – Installation of Ductile-Iron Water Mains and Their Appurtenances.

1.07 CONTRACTOR SUBMITTALS

A. Submit the following in accordance with Section 01300 – Submittals:
   1. Testing plan, procedures and schedule.
   2. Testing equipment.

PART 2 - PRODUCTS

Not Used.

PART 3 – EXECUTION

3.01 GENERAL

A. The City/Design Professional must witness the pressure and leakage test for it to be a valid test.
B. All sewer main joints and all manholes shall be watertight and free from leaks.
C. There is zero allowable leakage. All defects causing infiltration/exfiltration shall be corrected at no additional cost to the City.

3.02 SAFETY

A. All work shall be performed in accordance with applicable Occupational Safety and Health Administration (OSHA) standards.

3.03 SEWER PIPE ALIGNMENT AND GRADE TESTING

A. The alignment, grade and visible defects shall be checked as follows:
   1. Prior to inspection, the Contractor shall clean and flush the sewer main with clear water to remove excess mortar, joint sealant, dirt, debris etc.
   2. All sewer mains shall be mandrel tested to determine ovality, the presence of any misaligned, displaced, or broken pipes and other defects.
   3. All defects shall be corrected prior to conducting the pressure and leakage test.

3.04 PRESSURE AND LEAKAGE TEST FOR INFILTRATION/EXFILTRATION

A. Sewer pipe infiltration/exfiltration testing:
   1. There shall be zero leakage on the infiltration/exfiltration test.
   2. The Contractor shall perform hydrostatic or air pressure tests on all sewers before acceptance by the City. The Contractor shall provide all materials, labor and equipment required including, but not limited to, the following: water, necessary piping connections, test equipment, water meter, pressure gauges, bulkheads, and fittings required for hydrostatic or air pressure testing.
   3. Pressure and leakage testing for Infiltration/Exfiltration testing shall be conducted. Where evidence of infiltration/exfiltration is discovered by the Contractor or by the City/Design Professional, the Contractor shall repair or replace the defective reach of pipeline at no additional cost to the City. Following repair of the pipeline, the Contractor shall re-test and make additional repairs until zero infiltration/exfiltration is achieved.

4. Pressure and leakage testing for Infiltration/Exfiltration shall be performed by the Contractor using the methods as set forth below. The required testing shall be successfully performed on carrier conduits prior to filling the void between the casing and the carrier conduits with sand or the sealing of the ends of the casing conduits.
   a. Air Testing of Gravity Systems:
      (1) Each section of gravity pipeline between manholes and/or structures after backfill shall be tested as outlined below.
      (2) Contractor shall furnish all materials, labor and equipment required including necessary piping connection, test pumping equipment, pressure gauges, bulkheads, regulator to avoid over pressurization, and all miscellaneous items required.
      (3) The pipe plug for introducing air to the sewer line shall be equipped with two taps. One tap will be used to introduce air into the line being tested through suitable valves and fittings, so that the input air may be regulated. The second tap will be fitted with valves and fittings to accept a pressure test gauge indicating internal pressure in the sewer pipe. Additional valve and fitting will be incorporated on the tap used to check internal pressure so that a second test gauge may be attached to the internal pressure tap. The pressure test gauge valve may also be used to indicate loss of air pressure due to leaks in the sewer line.
      (4) The pressure test gauge shall meet the following minimum specifications:

Size (diameter)	4-1/2 inches
Pressure Range	0-15 psi
Figure Intervals	1 psi increments
Minor Subdivisions	0.05 psi
Pressure Tube	Bourdon Tube or diaphragm.
Accuracy	+/-0.25% of maximum scale
Dial	White coated aluminum with black lettering, 270degree arc and mirror edge.
Pipe Connection	Male 1/2 inch N.P.T.

      Calibration data will be supplied with all pressure test gauges. Certification of pressure test gauge will be required from the gauge manufacturer. This certification and calibration data will be available to the City/Design Professional whenever air tests are performed.
      (5) Plug ends of line and cap or plug all connections to withstand internal pressure. One of the plugs provided must have two taps for connecting equipment. After connecting air control equipment to the air hose, monitor air pressure so that internal pressure does not exceed 5.0 psig. After reaching 4.0 psig, throttle the air supply to maintain between 4.0 and 3.5 psig for at least two (2) minutes in order to allow equilibrium between air temperature and pipe walls. During this time, check all plugs to detect any leakage. If plugs are found to leak, bleed off air, tighten plugs, and again begin supplying air. After temperature has stabilized, the pressure is allowed to decrease to 3.5 psig. At 3.5 psig, begin timing to determine the time required for pressure to drop to 2.5 psig. If the time, in seconds, for the air pressure to decrease from 3.5 psig to 2.5 psig is greater than that shown in the table below, the pipe shall be presumed free of defects.

Minimum Test Times in Plastic Pipe

Pipe Diameter (in)	Minimum Time (min:secc)	Length for Minimum Time (ft)	Time for Longer Length (sec)
4	3:46	597	.380 L
6	5:40	398	.854 L
8	7:34	298	1.520 L
10	9:26	239	2.374 L
12	11:20	199	3.418 L
15	14:10	159	5.342 L
18	17:00	133	7.692 L
21	19:50	114	10.470 L
24	22:40	99	13.674 L
27	25:30	88	17.306 L
30	28:20	80	21.366 L
33	31:10	72	25.852 L
36	34:00	66	30.768 L
42	39:48	57	41.883 L
48	45:34	50	54.705 L
54	51:02	44	69.236L
60	56:40	40	85.476L

L = Total Length

If air test fails to meet above requirements, repeat test as necessary after all leaks and defects have been repaired and backfilled.

Before the manhole vacuum test is performed and in areas where ground water is known to exist, install a one-half inch diameter capped pipe nipple, approximately 10" long, through manhole wall above one of the sewer lines entering the manhole. This shall be done at the time the sewer is installed. Immediately prior to the performance of the line acceptance test, ground water level shall be determined by removing pipe cap, blowing air through pipe nipple into the ground so as to clear it, and then connecting a clear plastic tube to pipe nipple. The hose shall be held vertically and a measurement of height in feet of water shall be taken after the water stops rising in this plastic tube. The height in feet shall be divided by 2.3 to establish the pounds of pressure that will be added to all readings. If the air pressure required for the test is greater than 9 psig, the air test method will not be allowed. Instead, an infiltration test shall performed by the Contractor.

(6) If Polyvinyl Chloride (PVC) gravity sewer pipe is used it shall be air-tested in accordance with the requirements of ASTM F-1417.

b. Hydrostatic Tests for Pressure Systems (Sewer Force Mains):
   (1) Conformance Procedure: The Contractor shall perform hydrostatic pressure and leakage tests for all sewer force mains. The test shall conform to AWWA C600 procedures except as modified herein. There shall be zero leakage/drop in pressure.
   (2) Sectionalizing: Test in segments between sectionalizing valves, between a sectionalizing valve and a test plug, or between test plugs. Contractor shall furnish and install test plugs at no additional cost to the City, including all anchors, braces, and other devices to withstand hydrostatic pressure on plugs. Contractor shall be responsible for any damage to public or private property caused by failure of plugs. Limit fill rate of line to available venting capacity. Fill rate shall be regulated to limit velocity in lines when flowing full to not more than 0.05 to 1.0 fps.
   (3) Pressure and Leakage Test: Conduct at 1.5 times the maximum operating pressure, but not less than 100 psi, for a minimum of two hours:

$$L = (0.0000075\ SD(P)^{1/2})/2$$ where

L = 2 hour allowable make-up water (gallons)
S = length of pipe tested (ft.)
D = nominal pipe diameter (in)
P = test pressure (psig)

3.05 SEWER PIPE DEFLECTION TESTING

A. The mandrel testing shall be conducted again thirty days after final trench backfill.
B. The mandrel device shall be cylindrical in shape and constructed with nine (9) evenly spaced arms or prongs. Mandrels with fewer arms will be rejected as not sufficiently accurate. The rigid mandrel shall have an outside diameter (O.D.) equal to 95 percent of the inside diameter (I.D.) of the pipe. The inside diameter of the pipe, for the purpose of determining the outside diameter of the mandrel, shall be the average outside diameter minus two minimum wall thicknesses for O.D. controlled pipe and the average inside diameter for I.D. controlled pipe. Dimensions shall be per appropriate standard. The "D" mandrel dimension shall carry a tolerance of + or - 0.01 inch. Allowances for pipe wall thickness tolerances or ovality (from heat, shipping, poor production, etc.) shall not be deducted from the "D" dimension but shall be counted in as a part of the five (5) percent or lesser deflection allowance. Contact length (L) shall be measured between points of contact on the mandrel arm. The length shall not be less than twelve inches.
C. The mandrel shall be hand-pulled by the Contractor through all flexible sewer lines. Any sections of sewer not passing the mandrel test shall be uncovered and the Contractor, at no additional cost to the City, shall repair or replace the sewer to the satisfaction of the Engineer. These repaired segments shall be re-tested by the Contractor.
D. Following a successful thirty day mandrel test, all sewer mains shall be Laser Profiled, see SECTION 02687.

3.06 MANHOLE TESTING

A. All new manholes and fully rehabilitated manholes with pipe end seals installed shall be tested for infiltration/exfiltration by vacuum testing. All vacuum testing shall be performed in the presence of the City/Design Professional. Notification by the Contractor to the City/Design Professional shall be made 5 days in advance of testing. All visible defects and leaks shall be repaired by the Contractor prior to testing and then again during the warranty period.

B. Vacuum testing is required on all new manholes and fully rehabilitated manholes with a main line diameter of less than 42 inches.

C. Prior to payment for new manholes and fully rehabilitated manholes rehabilitation, the manholes shall pass the vacuum test as identified in this specification.

D. The initial vacuum test on new manholes or structure shall be conducted prior to backfilling. Vacuum testing after backfilling should be performed only after a successful non-backfill test has been completed. The Contractor shall not vacuum test backfilled manholes in the presence of ground water. All pipes entering the manhole shall be plugged at least eight (8) inches into the sewer pipe. The plug must be inflated at a location beyond the manhole/pipe gasket.

(1) All plugs shall be adequately braced to prevent the plug or pipe from being dislodged and drawn into the manhole.

(2) A vacuum of at least 10-1/2 inches of mercury shall be drawn on the manhole. The valve on the vacuum line to the manhole shall be shut and the vacuum line disconnected. The vacuum line valve shall be opened and the vacuum adjusted to 10 inches of mercury.

(3) The pressure gauge shall be liquid filled having a 3.5 inch diameter face with a reading from zero to 30 inches of mercury. The test equipment shall be capable of having two gauges connected. The gauge supplied with the test equipment shall match the reading of a gauge furnished by the City/Design Professional.

(4) The time for the vacuum reading to drop from 10 inches of mercury to 9 inches of mercury shall not be less than the following values for the manhole to be considered as passing the vacuum test:

Manhole Depth	Time in Minutes
10 feet or less	2
10.1 to 15 feet	2.5
15.1 to 25 feet	3

(5) If a manhole fails the vacuum test, the manhole shall be repaired with a City approved product and re-tested. This procedure shall be continued until all defects have been repaired and the manhole successfully passes the vacuum test.

3.07 WARRANTY

A. The Contractor shall warranty all work during the Performance and Maintenance period. All defects including infiltration/exfiltration found during the warranty period shall be corrected immediately at no additional cost to the City.

END OF SECTION

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.

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 City 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 City shall be obtained and each customer affected shall be notified of the proposed service interruption and its possible duration in accordance with the Work Covered by Contract Documents 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. Water

1. Water for testing shall be furnished as stipulated in the Temporary Facilities section. 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 not 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 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.

3.2 BLOCKING AND BACKFILLING

A. Piping shall be adequately blocked, anchored, and supported before the test pressure is applied. Underground piping identified in the Pipeline Test Pressure Schedule shall be tested before the joints are covered. All other piping may be tested after backfilling.

3.3 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. Piping shall be subjected to a hydrostatic test pressure as indicated in the Pipeline Test Pressure Schedule.

2. The test pressure, expressed in feet of water, to be applied at any point in the piping shall be equivalent to the arithmetic difference between the specified test pressure plane elevation and the elevation of the horizontal center line of the piping at the selected location. The value obtained shall be multiplied by 0.433 to obtain psi.

C. Plant Piping Test Pressure

1. Piping shall be subjected to the test pressure as indicated in the Plant Piping Test Pressure Schedule.

3.4 PIPELINE LEAKAGE TESTING

A. The pipeline piping shall be subjected to a leakage test. Leakage testing may be conducted concurrently with pressure testing. The duration of the leakage test shall be 2 hours plus the additional time required for Engineer to make an accurate determination of leakage.

B. Leakage Test Pressure

1. The hydrostatic pressure maintained during the leakage test shall be equal to the pressure specified for pressure testing of the piping and shall be maintained within plus or minus 5 psi during the entire time that leakage measurements are being performed.

C. Leakage Measurement

1. Measurement of leakage shall not be attempted until all trapped air has been vented, absorption of water by the pipe wall or lining has stabilized, and a constant test pressure has been established. After the pressure has stabilized, piping leakage shall be measured with a suitable water meter installed in the pressure piping on the discharge side of the force pump.

D. Allowable Leakage

1. The term "leakage", as used herein, refers to the total amount of makeup water which must be added into the piping during the test to maintain the test pressure.

2. No piping will be accepted if and while it exhibits a leakage rate in excess of that determined by the indicated formulas:

$$Q = 0.00676\ DLN \text{ (using inch-pound units)}$$

Where

Q = allowable leakage in gallons per hour

D = nominal diameter of pipe in inches

L = length of section tested in thousand feet

N = square root of weighted average test pressure in pounds per square inch

3. The weighted average test pressure shall be equivalent to the arithmetic difference between the specified test pressure plane elevation in feet and the average elevation of the pipeline in feet, multiplied by 0.433 to obtain psi. The weighted average elevation of the pipeline shall be calculated by (1) breaking the pipeline into sections at each significant change in slope and multiplying the average elevation of each section by the length of each section, (2) then summing the products, and (3) dividing the sum by the total length of the pipeline.

4. Whenever the piping to be tested contains pipe of different diameters, the allowable leakage shall be calculated separately for each diameter and the corresponding length of piping. The resulting allowable leakage rates shall be added to obtain the total allowable leakage for the entire piping.

5. All joints in piping shall be free from visible leaks during the leakage test. Each leak which is discovered within the correction period stipulated in the General Conditions shall be repaired by and at the expense of Contractor regardless of the amount that the total leakage may have been below the specified allowable leakage rate during the leakage test.

6. If the leakage test indicates a higher than allowable leakage rate, Contractor shall locate and repair leaking joints and other defective work and repeat the test the until leakage rate is less than the allowable rate.

End of Section

Schedule 02704-S01

Test Pressure Schedule

Piping Designation	Location	Test Pressure Plane Elevation Above Mean Sea Level	Test Pressure	Test Before Joints Covered
		ft	psig	
North Rock Box Recirculation line	Inside TCPS	740-750	50	N/A
North Rock Box Recirculation line	Buried	741-745	50	Yes

End of Section

SECTION 02930 - SEEDING

PART 1 - GENERAL

1.1 SCOPE OF WORK.

A. Furnish the necessary equipment, labor and materials required and perform all work in connection with seeding for areas to be restored as shown on the Drawings and as specified at the time of bidding in American Public Works Association Standard Specifications and Design Criteria Section 2100 as revised, adopted, and provided by the director of Kansas City, Missouri Public Works.

1.2 REFERENCE STANDARDS.

A. In addition to complying with all pertinent codes and regulations, comply with the referenced or applicable portions of the American Public Works Association Standard Specifications and Design Criteria, and the Kansas City, Missouri Standards and Specifications for Water Main Extensions and Relocations available at the time of bidding.

B. The following standards are referenced directly in this section. The latest version of these standards shall be used.

1. FS O-F-241 – Fertilizers, Mixed, Commercial.

1.3 DEFINITIONS.

A. Seeding areas.

1. All areas disturbed by construction operations including areas of cut and fill, trenching, temporary roads, and temporary staging or storage areas shall be seeded unless otherwise specified.

B. Sequence of Work.

1. Sequence shall be clearing, grading, fertilizing, tilling, seeding, covering and firming, and application of mulch. All seeded areas shall be mulched with grain straw or wood cellulose fiber, or covered with erosion control fabric.

C. Weeds.

1. Include Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.

1.4 SUBMITTALS:

A. Follow the procedures for submittals provided in Section 01300 - Submittals.

B. Invoices and Analysis Labels.

1. A copy of the supplier's invoices for all seed, mulch, and fertilizer which shows the quantity by weight purchased and a representative label bearing the manufacturer's or vendor's guaranteed statement of analysis shall be submitted to the Engineer for review and approval to assure compliance with specified requirements for quality and application rates.

1.5 QUALITY ASSURANCE.

A. Comply with regulatory agencies for fertilizer and herbicide composition.

B. Seed and Fertilizer shall be labeled in accordance with U.S. Department of Agriculture Rules and Regulations under the Federal Seed Act and State seed laws. Seed shall be furnished in sealed standard containers of the vendor. Each seed container shall bear the name, trade name, or trade mark, and a warranty of the producer and a certificate of the percentage of the purity and germination of each kind of seed specified. Seed which has become wet, moldy, or otherwise damaged in transit or in storage will not be acceptable.

C. All seeding work shall be performed by a contractor having demonstrated experience in seeding on projects of similar size. The work shall be prepared by experienced personnel who are familiar with the required work and who are under the supervision of a qualified foreman at all times when the work is in progress.

D. The Contractor shall have access to equipment such as a fertilizer spreader, farm tractor with tilling equipment, grass seed drill or cultipacker type seeder, mulch blower, or hydromulcher for application of mulch, and straight serrated disk for crimping mulch into the soil.

1.6 DELIVERY, STORAGE, AND HANDLING.

A. Follow the provisions for the delivery, storage, protection and handling Product to and at site provided in Section 01600 - Material and Equipment.

B. Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable.

C. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

PART 2 - PRODUCTS

2.1 SOIL FOR REPAIR.

A. The soil used in any repair work shall be of a quality at least equal to that in areas adjacent to the area to be repaired. Soil shall be free from tree roots, clay balls, stones, and other materials that hinder grading, planting, and maintenance operations and that is free from noxious and other objectionable weed seeds and toxic substances.

2.2 MULCH.

A. Vegetative Type Mulch.

1. Vegetative Type Mulch shall be baled, dry, unweathered, no discoloration or mold damage.A minimum of 50 percent of weight of the herbage making up the material shall be a minimum of 10 inches in length. Mulch material containing an excessive amount of weed and crop seeds will not be acceptable.

B. Wood Cellulose Fiber Mulch.

1. Prepared from virgin wood fibers containing no substance that might inhibit germination or growth of grass seed. Mulch shall be dyed an appropriate color to allow visual maintenance of its application and shall contain a tacking agent. The wood cellulose fibers shall be evenly dispersed and suspended when agitated in water. When sprayed uniformly on the surface of the soil, the fiber shall form a blotter-like ground cover that readily absorbs water and allows infiltration to the underlying soil. Weight specifications from suppliers, and for all applications, shall refer only to air dry weight of the fiber, at a standard equivalent of 10 percent nominal moisture content.

2. The mulch material shall be supplied in packages having a gross weight not in excess of 100 pounds and shall be marked by the manufacturer to show the air-dry weight. Suppliers shall certify that laboratory and field testing of their product has been conducted. Certificates shall be submitted in accordance with Section 01300 and that it meets all of the foregoing requirements pertaining to wood cellulose fiber mulch.

2.3 FERTILIZER AND HERBICIDE.

A. Starter Fertilizer.

1. Fertilizer shall be pelleted or granulated and shall be an approved brand composed of a “Slow Release Nitrogen” fertilizer in the 1-2-1 range, such as 13-25-12 grade. Fertilizer shall be uniform in composition, free flowing and suitable for application with approved equipment.

B. Herbicide.

1. Pre-emergent herbicide shall be siduron (Tupersan). In areas where herbicide runoff may compromise water quality, herbicide should be Glyphosage, N-(phosphonomethyl) glycine in a form approved for aquatic applications.

2.4 SEED.

A. Pure Live Seed.

1. The following formula shall be used to determine the amount of commercial seed required to provide each kind of seed for the specified quantities of pure live seeds:

$$\text{Pounds of Commercial Seed Required} = \frac{10{,}000 \times \text{Pure Live Seeds (lbs. Per acre)}}{\text{Purity (percent)} \times \text{Germination (percent)}}$$

B. Type “A” Seed.

1. This seeding mixture will normally be used when seeding is required in areas of non-residential established lawns, shoulders and slopes in street right-of-way, and any other areas where a high-type seeding is deemed necessary. The seed mixture will be 100 percent Turf-Type Tall Fescue composed of an equal mix of three of four compatible species. The mixture shall not include any varieties of the slower growing Turf-Type Tall Fescue. The species shall be one of the following or equal as approved by the City:

Apache	Arid	Austin
Bonanza	Carefree	Chieftan
Cimmaron	Cochise	Falcon
Guardian	Houndog	Jaguar II
Maverick II	Mustang	Olympic
Phoenix	Rebel II	Rebel 3D
Safari	Shenandoah	Thoroughbred
Titan	Tribute	Vegas

2. The seed mixture shall also include 100 percent Annual Rye grass to provide a temporary grass stand. The seed mixture shall be sowed at a rate of 10 lbs. per 1000 square feet (436 lbs. per acre) of the Turf-Type Tall Fescue and 2 lbs. per 1000 square feet (87 lbs. per acre) of the Annual Rye.

C. Type “B” Seed.

1. This seeding mixture will normally be used to seed areas off street right of ways that are not maintained.

Kind of Seed	Minimum Pure Live Seed	Rate of Pure Live Seed (Lbs. per Acre)
Alta Fescue or Kentucky 31 Fescue (Festuca Elation Var. Arundinces)	75	90
Rye grass (Lolium Perenne or L. Multiflorum)	80	50
TOTAL		140

D. Type "C" Seed.

1. This seeding mixture will normally be used in public parks, wildlife refuges, and any other areas where this seeding mixture is deemed necessary. The types of seeding mixtures for different habitats will be as follows:

Planting Habitat	Scientific Name	Common Name	Initial or Permanent Cover	Coverage
Wet Woodland	Elymus virginicus L.	Virginia Wild Rye	P	3 lbs./ac pls.
	Cinna arundinacea L.	Woodreed	P	100 plants/ac
	Sporobolis heterolepis A. Gray	Prairie Dropseed	I,P	3 lbs./ac pls.
	Elymus canadensis L.	Canada Wild Rye	P	3 lbs./ac pls.
	Festuca octoflora	Six-weeks Fescue	I	0.5 lbs./ac pls.
	Triticum aestivum L.	Winter Wheat	I	60 lbs./ac pls.

Planting Habitat	Scientific Name	Common Name	Initial or Permanent Cover	Coverage
Dry Woodland	Elymus canadensis L.	Canada Wild Rye	P	3 lbs./ac pls.
	Elymus virginicius L.	Virginia Wild Rye	P	3 lbs./ ac pls.
	Sporobolis heterolepis A. Gray	Prairie Dropseed	I,P	3 lbs./ac pls.
	Triticum aestivum L.	Winter Wheat	I	60 lbs./ac pls.

Planting Habitat	Scientific Name	Common Name	Initial or Permanent Cover	Coverage
Wet Open	Elymus canadensis L.	Virginia Wild Rye	P	3 lbs./ac pls.
	Echinochloa muricata Fern.	Rough Barnyard grass	I,P	2 lbs./ac pls.
	Spartina pectinata	Prairie Cordgrass	P	200 rhiz./ac
	Leersia oryzoides	Redtop Bentgrass	P	200 rhiz./ac
	Triticum aestivum L.	Winter Wheat	I	60 lbs./ac pls.

2. Adding Switchgrass (Panicum virgatum – 3 lbs./acre) to the wet open mix would be a good idea. Of the native grasses listed, it provides the greatest soil erosion control because of its extensive root system. It is also drought tolerant and a warm season grass while the others are primarily cool season.

PART 3 - EXECUTION

3.1 PREPARATION OF SUBSOIL.

A. General.

1. The work shall not be started until substantially all earthwork has been completed in the area to be seeded. The topsoil spread and finish grading shall be completed immediately before the seeding work is started.

B. Clearing.

1. Prior to grading and tilling, vegetation that may interfere with operations shall be mowed, grubbed, and raked. The collected material shall be removed from the site. The surface shall be cleared of stumps, stones, cable, wire, and other materials that might hinder the work or subsequent maintenance.

C. Grading.

1. Establish and maintain grades, in a true and even condition. Eroded areas and areas having inadequate drainage, as indicated by ponding of water, shall be filled. Ruts, deep tracks, dead furrows, and ridges shall be eliminated.

D. Cleanup.

1. Within reasonable time after completion of the construction operations, the entire area shall be cleared of excess soil and waste material, including, but not limited to, stones, stumps, roots, brush, wire, grade stakes, and all objects that might be a hindrance to maintenance operations or affect the visual appearance of the site. All roads over which hauling operations have been conducted, regardless of the type of surfacing, shall be kept clean, and soil clods and debris left on the surface shall be removed. The wheels of

vehicles shall be cleaned to avoid leaving soil upon the surface of roads, walks, and other surfaced areas.

3.2 FERTILIZING.

Application of Fertilizer: Fertilizer as specified shall be applied within 24 hours prior to the tilling operation. The fertilizer shall be distributed over the entire area to be seeded at the rate of 200 pounds per acre, and incorporated into the soil to a depth of at least 4 inches by disking or harrowing methods. Fertilizing rate is equivalent to 2.3 pounds per 500 square feet.

3.3 SEEDING.

A. Preparation of Seed Bed.

1. After fertilizer has been applied, the areas to be seeded shall be tilled to a depth of at least 4 inches by disking, plowing, harrowing, or other accepted methods until the soil is well pulverized and smoothed with a weighted spike-tooth harrow, railroad chains, or bridge timber float drag. When a chisel plow is used, the chisels shall be set not more than 10 inches apart and the areas shall be cross- or double-tilled. All areas shall be left smooth for ease of mowing. All operations shall be done in a direction parallel to the contour lines on the slope and not uphill or downhill. Areas tilled shall be maintained until seeding and mulching is complete to insure a smooth area with no gullies or depressions.

B. Application of Seed.

1. Seeding equipment calibration tests shall be made in the presence of the Inspector to determine the equipment setting required to apply the seed at the specified rates. Markers shall be used to ensure that no skips occur between successive passes of the seeder. If unplanted skips and areas are noted after germination and the growth of the grass, the unplanted areas shall be prepared again, fertilized, seeded, compacted, protected with herbicide (Section 3-4.01) and mulched (Section 3-4.02) as if none of those steps had previously taken place. The seed box shall be kept at least half full during seeding operations to ensure even distribution of seed over all the areas seeded. The types of acceptable seeding depending upon the area are as follows:

2. All seeding work shall be done between the dates of February 1 and April 15 for spring planting or August 15 and October 15 for fall planting. Sowing shall be accomplished by use of an approved mechanical seeder or drill (hand spreader can be used in small areas), making sure that successive seed strips overlap to provide uniform coverage. The mixtures shall be applied in a crossing pattern of two passes, each applying half of the seed required. Seed should be drilled to a depth of 1/2 inch. The sprigs (rhizomes) shall be broadcast evenly and uniformly on the soil surface.

C. Compaction.

1. Immediately following the completion of seeding operations, the entire area shall be compacted by means of a roller weighing at least 60 but not more than 90 pounds per linear foot of roller or any other method approved by the Engineer.

3.4 SEED PROTECTION.

A. Application of Herbicide.

1. Following completion of seeding operations, pre-emergent herbicide as specified shall be applied to all seeded areas at the rate suggested by the manufacturer.

B. Mulching.

1. Mulching shall be done within 24 hours following the seeding operation except in the case of wood cellulose type mulch.

C. Vegetative Type Mulch.

1. Straw mulch shall be spread uniformly in a continuous blanket at a depth of not less than 1-1/2 inches and not more than 2 inches loose measurement (approximately 1-1/2 to 2 tons per acre). Mulch shall be spread by hand or by a blower type mulch spreader. Blower type mulch spreaders shall be adjusted and operated in such a manner as to prevent excessive breakage of the mulch material. If this cannot be accomplished, the mulch shall be spread by hand. Care shall be exercised to ensure that all wire from baled hay is collected as it is removed from the bale. Mulching shall be started at the windward side of relatively flat areas, or at the upper part of a steep slope, and continued uniformly until the area is covered. The mulch shall not be bunched.

2. No mulch shall be spread unless it can be anchored on the same day.

D. Anchoring Straw Mulch.

1. The straw mulch shall be anchored in the soil to a depth of 2 to 3 inches by a notched disk set straight or a mulch crimping machine. The machine shall be weighted and operated in such a manner to secure the mulch firmly in the ground to form a soil binding mulch and prevent loss or bunching of straw by wind. Two or more passes may be required to anchor the mulch to the satisfaction of the City.

E. Application of Wood Cellulose Fiber.

1. Wood cellulose fiber mulch shall be applied with a hydromulcher at not less than 1000 pounds per acre. Precautionary measures shall be taken in preventing overspray on structures, paving, and plantings.

3.5 MAINTENANCE

A. Watering.

1. Promptly after seeding and mulching, wet the seedbed thoroughly. Watering shall continue so as to keep all areas moist throughout the germination period.

B. Water Usage.

1. Water used in this work shall be furnished by the Contractor and shall be suitable for irrigation and free from ingredients harmful to plant life. All watering equipment required for the work shall be furnished by the Contractor. Water shall be taken from adjacent fire hydrants or public water lines only through hydrant connections permitted and issued by City. Written approval from the property City shall be obtained prior to the use of suitable water from ponds or creeks. Water from private Citys shall also be metered.

C. Maintenance of Area.

1. The Contractor shall be responsible for maintaining all seeded areas until acceptance by the City. If at any time before acceptance of the completed contract, any portion of the seeded surface becomes gullied or otherwise damaged, or the seeding has been damaged or destroyed, the affected portion shall be cleared of stones, etc. and repaired to re-establish the specified condition prior to the acceptance of the work.

2. In established yards, shoulders and slopes in street right-of-way, and any other areas where a Type “A” seeding is necessary, all newly seeded grassed areas shall be kept in a healthy growing condition by watering, weeding, mowing, trimming, edging, etc., until completion and acceptance by City. The seeded areas shall be mowed with approved mowing equipment to a height of 3 inches whenever the average height of vegetation becomes 6 inches.

3. Turf grass of one-square foot or more that does not show definite growth and establishment shall be re-seeded in accordance with all requirements of this section including soil preparation and mulching. The Contractor shall continue the care and maintenance of all seeded areas as specified above until all work of this project has been satisfactorily completed and all deficiencies have been corrected at which time final inspection shall be made.

D. Areas Off of Street Right-of-Way (Type “B” Seed).

1. All seeded areas shall be maintained until acceptance by the Engineer. Maintenance shall include repair of erosion damage, re-seeding, including all preparation requirements maintenance of mulch, and watering.

End of Section

SECTION 03100 - CONCRETE FORMING

PART 1 - GENERAL

1.1 SCOPE

A. This section covers formwork for cast-in-place concrete.

B. Both inch-pound (English) and SI (metric) units of measurement are specified herein; the values expressed in inch-pound units shall govern.

1.2 GENERAL

A. All forms shall be accurately and properly placed so cast-in-place concrete may be placed as indicated on the Drawings and as specified. The forms shall produce a smooth concrete finish free from offsets or irregularities.

1.3 SUBMITTALS

A. Drawings and Data

1. All submittals of catalog data sheets, manufacturers' certificates of compliance and other data shall be in accordance with the Submittals Procedures section.

B. Certificates of Compliance

1. A manufacturer's certificate of compliance, which includes the name of the project and, when requested, copies of independent test results confirming compliance with specified requirements, shall be submitted to Engineer for the following materials:

    a. Form Coating
    b. Form Ties

PART 2 - PRODUCTS

2.1 MATERIALS.

Forms

Prefabricated	Simplex "Industrial Steel Frame Forms," Symons "Steel Ply," or Universal "Uni-form."
Plywood	Product Standard PS1, waterproof, resin-bonded, exterior type Douglas fir, face adjacent to concrete Grade B or better.

Fiberboard	ANSI/AHA A135.4, Class 1, tempered, water-resistant, concrete form hardboard.
Lumber	Straight, uniform width and thickness, and free from knots, offsets, holes, dents, and other surface defects.
Chamfer Strips	Clear white pine, surface against concrete planed.
Form Coating	Nonstaining and nontoxic after 30 days. Product shall not exceed VOC limits established by the federal, state, or local regulatory agency having jurisdiction over the project site.

2.2 FORMS

A. Forms shall be designed to produce hardened concrete having the shape, lines, and dimensions indicated on the Drawings. Forms shall conform to ACI 347R and the following additional requirements.

1. Stay-in-place metal formwork will not be permitted.

2. Form-facing materials shall be selected in accordance with ACI 347.3R, based upon the applicable formed concrete surface category. Formed concrete surface categories vary by structure and application, and shall be as indicated in the Concrete Finishing section. Other types of forming materials, such as steel or unlined wood, may be used where plywood or lined forms are not required, and may be used as backing for form linings. Forms for exposed surfaces shall be laid out in a regular and uniform pattern with the long dimension of panels vertical and all joints aligned. The forms shall produce finished surfaces that are free from offsets, ridges, waves, and concave or convex areas, within the tolerances specified herein.

3. All vertical concrete surfaces above footings shall be formed.

4. Flat segmented forms not more than 24 inches wide may be used for forming curved surfaces 25 feet in diameter or larger.

B. Design

1. Forms shall be substantial and sufficiently tight to prevent leakage of mortar. Forms shall be braced or tied to maintain the desired position, shape, and alignment during and after concrete placement. Walers, studs, internal ties, and other form supports shall be sized and spaced so that permissible working stresses are not exceeded.

2. Beams and slabs supported by concrete columns shall be formed so that the column forms may be removed without disturbing the supports for the beams or slabs.

3. Wherever the top of a wall will be exposed to weathering, the forms on at least one side shall not extend above the top of the wall and shall be brought to true line and grade. At other locations, forms shall be brought to a true line and grade, or a wooden guide strip shall be placed at the proper location on the forms so that the concrete surface can be

finished with a screed or template to the specified elevation, slope, or contour. At horizontal construction joints in walls, the forms on one side shall not extend more than 2 feet above the joint.

4. Temporary openings shall be provided at the bottom of column and wall forms and at other points where necessary to facilitate cleaning and inspection.

C. Form Ties

1. Form ties shall have removable end and permanently embedded body, and shall have sufficient strength and rigidity to support and maintain the form in proper position and alignment without the use of auxiliary spreaders. Cones shall be provided on the outer ends of each tie, and the permanently embedded portion shall be at least 1 inch back from the concrete face. Form ties for walls with waterstops at joints shall be provided with water stop washers located on the permanently embedded portions of the ties at the approximate center of the wall. The ties shall be smooth at the location of the water stop washer; continuously threaded systems will not be acceptable. Permanently embedded portions of form ties without threaded ends shall be constructed so that the removable ends are readily broken off without damage to the concrete. Through-wall tapered removable ties will not be acceptable. The type of form ties used shall be acceptable to Engineer.

2. Form ties in exposed surfaces shall be uniformly spaced and aligned in horizontal and vertical rows.

D. Edges and Corners

1. Chamfer strips shall be placed in forms to bevel all salient edges and corners, except the top edges of walls and slabs which are to be tooled and edges which are to be buried. Equipment bases shall have formed beveled salient edges for all vertical and horizontal corners, unless specifically indicated otherwise on the Drawings. Unless otherwise noted, bevels shall be 3/4 inch wide.

PART 3 - EXECUTION

3.1 PLACEMENT

A. The limits of each concrete pour shall be determined by Contractor and shall be acceptable to Engineer.

B. Before concrete is placed, forms shall be rigidly secured in proper position; all dirt, mud, water, and debris shall be removed from the space to be occupied by concrete; all surfaces encrusted with dried concrete from previous placements shall be cleaned; and the entire installation shall be acceptable to Engineer. Remove all frost, ice, and snow from within the formwork before concrete is placed.

3.2 TOLERANCES

A. Tolerances for cast-in-place concrete work shall be as indicated in ACI 347.3R, based upon the relevant formed concrete surface category.

B. Formed concrete surfaces that are to have a face-mounted flat steel or FRP member attached, including but not limited to items such as weir plates or shelf angles, shall have more stringent flatness requirements. The surface profile shall permit the installation of the flat member without grinding the concrete surface (except for removal of fins), deforming the flat member, or requiring usage of backer rods or shims.

3.3 FORM COATING

A. All concrete forms shall have form release agent applied to them before placement of concrete.

3.4 FORM REMOVAL

A. Forms shall not be removed from structures until the concrete in the structures has sufficient strength to support the weight of the structure and any superimposed load, including loads from construction operations. Contractor shall be responsible for limiting any applied loadings. There shall be no evidence of damage to concrete and no excessive deflection or distortion of members due either to the removal of forms or to loss of support.

B. Supporting formwork (soffit material only) for horizontal members shall not be removed until the concrete has attained at least 75 percent of the specified 28 day compressive strength as determined by cylinders made and cured in the field. Shoring systems for horizontal members shall not be removed until the concrete has attained the full specified 28 day compressive strength, but may be temporarily removed for the purpose of removing the soffit material as permitted above. Shoring shall be left in place and reinforced as necessary to carry any construction equipment or materials placed thereon.

C. When forms are removed before the specified curing is completed, measures shall be taken to immediately continue curing and to provide adequate thermal protection for the concrete.

End of Section

SECTION 03200 - CONCRETE REINFORCING

PART 1 - GENERAL

1.1 SCOPE

A. This section covers reinforcement for cast-in-place concrete.

B. Both inch-pound (English) and SI (metric) units of measurement are specified herein; the values expressed in inch-pound units shall govern.

1.2 SUBMITTALS

A. Drawings and Data

1. All submittals of drawings, manufacturers' certificates of compliance, certification of reinforcement, reinforcement bar lists, placement drawings, test data, catalog data sheets and other data shall be in accordance with the Submittal Procedures section.

2. Bar lists and drawings for the fabrication and placing of reinforcement shall be submitted for review and shall have sufficient plans, elevations, and sections to adequately detail and label all reinforcement. The bar lists and drawings shall also include a reference to the structure in which the reinforcement will be installed and to the Drawing showing the reinforcement.

3. Reinforcement fabrication drawings shall not be submitted until Engineer has reviewed and accepted any applicable concrete placement sequence submittals, as indicated in the Concrete Placing section.

B. Manufacturer's Certificate of Compliance

1. A manufacturer's certificate of compliance, which includes the name of the project and, when requested, copies of independent test results confirming compliance with specified requirements, shall be submitted to Engineer for the following materials:

a. Mechanical connectors

PART 2 - PRODUCTS

2.1 MATERIALS.

Bars	ASTM A615, Grade 60, deformed.

Bars, Weldable	ASTM A706 or A615, Grade 60, deformed, with maximum carbon equivalent of 0.55%.
Shear Bars	ASTM A615, Grade 60, smooth.
Welded Wire Fabric	ASTM A1064, Grade 70.
Bar Supports	CRSI Class 1, plastic protected; or Class 2, stainless steel protected. Precast concrete bricks shall not be used without approval of Engineer.
Mechanical Connectors	Splicing system meeting Type 2 tensile requirements of ACI 318. Products shall have a current evaluation report verifying testing per ICC-ES AC 133.
Threaded Type	Dayton Superior “DBDI Splice System,” nVent “LENTON Mechanical Splicing Systems”, or Barsplice Products “Grip-Twist” system.
Locking Type	Dayton Superior “Bar-Lock Coupler System”, nVent “LENTON Connect System”, or Barsplice Products “Zap Screwlock Type 2 Mechanical Connector” system.

2.2 REINFORCEMENT

A. Reinforcement shall be accurately formed and shall be free from loose rust, scale, concrete splatter, and contaminants which reduce bond. Unless otherwise indicated on the Drawings or specified herein, the details of fabrication shall conform to ACI SP-66 and ACI 318. Reinforcement shall not be bent in the field without approval of Engineer.

B. Splices

1. Splices shall conform to the details indicated on the Drawings. Splices at locations other than those indicated on the Drawings shall be submitted to Engineer for review and concurrence.

2. The reinforcement splice locations shall be coordinated with the construction joint locations and concrete placement sequence.

C. Mechanical Connectors

1. Mechanical connectors shall be used only as indicated on the Drawings. Connections in adjacent bars shall be spaced at least 30 inches apart.

D. Welding

1. Except where indicated on the Drawings, welding or tack welding of reinforcement is not permitted. Preheating and welding shall conform to AWS D1.4. Reinforcement which has been welded improperly or without Engineer's concurrence shall be removed and replaced.

PART 3 - EXECUTION

3.1 STORAGE AND HANDLING

A. Reinforcing steel shall be carefully handled and shall be stored on supports which prevent the steel from touching the ground.

B. Epoxy-coated reinforcement shall be handled using equipment with protected contact areas. Bundles or stacks of epoxy-coated reinforcement shall be lifted at multiple points to prevent abrasion from sags. Epoxy-coated reinforcement shall not be dropped or dragged and shall be stored on protective cribbing. Faded or chalking coating will not be cause for rejecting epoxy-coated reinforcement.

3.2 PLACEMENT

A. Reinforcement shall be accurately positioned on supports, spacers, hangers, or other reinforcement, and shall be secured in place with wire ties or suitable clips. Tolerances shall be as stipulated in ACI 117 and ACI 318 unless otherwise indicated.

B. Reinforcement at the bottom of concrete slabs and mats shall not be supported from contact with subgrade by the use of metal supports or bent reinforcement.

C. Where reinforcement in beams is placed in two or more layers, the bars in the upper layer shall be placed directly above the bars in the lower layer.

D. Reinforcement for beams or slabs which are supported by concrete columns shall not be installed until after the concrete for the column has been placed.

E. Before concrete is placed, reinforcement shall be rigidly secured in proper position. All surfaces encrusted with dried concrete from previous placements shall be cleaned and the entire installation shall be acceptable to Engineer. Remove all frost, ice, and snow before concrete is placed.

F. Epoxy-coated reinforcement shall be fastened with nylon, epoxy, or plastic-coated tie wire.

3.3 PLACING CONCRETE

A. Concrete shall be placed and compacted in wall or column forms before any reinforcement is placed in the system to be supported by such walls or columns.

3.4 DUCT BANKS

A. All reinforcement and other magnetic materials installed in duct banks shall be installed parallel to the individual ducts, unless they enclose all the ducts of the duct bank.

End of Section

SECTION 03250 - CONCRETE JOINTS AND ACCESSORIES

PART 1 - GENERAL

1.1 SCOPE

A. This section covers concrete accessories including construction, contraction and expansion joints for cast-in-place concrete.

B. Both inch-pound (English) and SI (metric) units of measurement are specified herein; the values expressed in inch-pound units shall govern.

1.2 GENERAL

A. All accessories shall be accurately placed and all joints shall be accurately and properly constructed so cast-in-place concrete can be placed as specified and as indicated on the Drawings.

1.3 Submittals

A. Drawings and Data

1. All submittals of manufacturers' certificates of compliance, test data, reports, catalog data sheets and other data shall be in accordance with the Submittal Procedures section.

PART 2 - PRODUCTS

2.1 MATERIALS

PVC Waterstops	Material shall meet the requirements of CRD-C-572, shall be white (no pigment), ribbed, 3/8 inch min thick, size as indicated on the drawings. Reclaimed material will not be acceptable. Provide hog rings or grommets spaced at 12 inches on center entire length.
6 inches wide, at construction joints	Greenstreak "679", JP Specialties "PVC637", or Vinylex "R638."
9 inches wide, at construction joints	Greenstreak "646", JP Specialties "PVC937", or Vinylex "R938."
6 inches wide, at control joints	"O" bulb closed center section; Greenstreak "732", JP Spcialties "PVC638", or Vinylex "RB638H."

9 inches wide, at control joints	"O" bulb closed center section; Greenstreak "735", JP Specialties "PVC938", or Vinylex "RB938H."
TPV Waterstops	Thermoplastic elastomeric rubber, meeting the CRD-C-572 requirements for tensile strength, elongation, and low temperature brittleness. Black, ribbed, center bulb, size as indicated on the drawings. For ozone resistance – no cracking at 450 pphm per ASTM D1171.
6 inches wide	3/16 inches min thick; minimum 0.5 lbs/ft . J.P. Specialties "Earth Shield – Part No. 636" or Westec "Style 619."
9 inches wide	3/16 inches min thick, minimum 0.8 lbs/ft . J.P. Specialties "Earth Shield – Part No. 936" or Westec "Style 620."
Expandable Waterstops, permitted only at locations indicated on Drawings	
For concrete sections that are at least 10 inches thick and 6 feet high, and with at least two layers of reinforcement	Hydrophilic; bentonite free, chemically modified rubber. Adeka "Ultra Seal MC-2010MN" or Greenstreak "Hydrotite CJ-1020-2K." Adhesive and sealant as recommended by the manufacturer.
For other concrete sections	Hydrophilic; chemically modified rubber. Adeka "KBA-1510FP" or Greenstreak "Swellstop." Adhesive and sealant as recommended by the manufacturer.
Expansion joint materials	
Filler	Preformed sponge rubber, ASTM D1752, Type I.
Filler adhesive	As recommended by manufacturer.
Sealant	As specified in the Joint Sealants section.
Polyethylene film	NBS Product Standard PS17 or ASTM D4397, 6 mils or thicker.
Vapor retarder and seam tape	Polyolefin membrane, 15 mil min, ASTM E1745, Class A, with maximum water vapor permeance of 0.02 perms. Stego Industries "Stego Wrap 15 Mil," Raven Industries "Vaporblock 15," Reef Industries "Griffolyn 15 Mil Green," W.R. Meadows "Perminator 15," Insulation Solutions "Viper VaporCheck II." Manufacturer recommended seam tape and pipe boots.
Bearing pads (dry environment)	Preformed cotton duck reinforced pads, at least 1/4 inch thick; JVI "Capralon" or Voss Engineering "Sorbtex."
Bearing pads (damp or humid environment)	Neoprene, natural rubber, or PVC.

Neoprene	Minimum ultimate tensile strength of 1500 psi, minimum elongation of 500% (ASTM D412), and a maximum compressive set of 50% (ASTM D395 Method A), with hardness of 30 to 60 durometers (ASTM D2240, Type A Durometer). Neoprene shall contain only virgin, crystallization-resistant polychloroprene as the raw polymer, and physical properties shall be in accordance with ASTM D2000, Line Call-Out M2BC4105A14B14.
Natural rubber	Rubber shall contain only virgin natural polyisoprene as the raw polymer, and physical properties shall be in accordance with ASTM D2000, Line Call-Out M4AA41413.
PVC	PVC shall meet CRD-C-572.
Epoxy bonding agent	As specified in Concrete Placing section.

PART 3 - EXECUTION

3.1 CONSTRUCTION JOINTS

A. Construction joints shall be made at locations indicated on the Drawings or where specified. Construction joints shall not be made at other locations without the concurrence of Engineer.

B. Location

1. Construction joints shall be located as follows:

a. Bottom Slabs. Slabs with a transverse reinforcement pattern shall be divided into approximately square sections not to exceed 60 feet in their longest dimension. Slabs with a radial and circumferential reinforcement patter shall be divided into circular segments not to exceed 60 feet diameter, or into pie-shaped segments not to exceed 60 feet in the longest circumferential distance.

b. Columns. Provide joints at the underside of beams, girders, haunches, drop panels, and column capitals, and at floor levels. All haunches, drop panels, and column capitals shall be considered part of the supported floor or roof and shall be placed monolithically therewith. Column bases will not be required to be monolithic with the floor beneath.

c. Walls. Provide joints at the underside of beams, girders, haunches, drop panels, and at floor levels. All haunches and drop panels shall be considered part of the supported floor or roof and shall be placed monolithically therewith. Walls shall be divided into sections not to exceed 60 feet in length. Joints shall be located within 30 feet of corners for liquid-containing structures and within 40 feet of corners for non-liquid containing structures. Walls supporting beams shall have pockets blocked out so that the full beam cross section penetrates the full thickness of the wall. Where waterstops are required in the joint, the wall pocket shall be widened and deepened to prevent interference between the waterstop and the beam reinforcement.

d. Beams, Girders and Suspended Slabs. Provide joints within the middle third of the span, and as close as practicable to the 1/3 point of the span. If a beam intersects a girder, the joint in the girder shall be offset by at least twice the width of the beam. Integral beam and slab systems shall be monolithic and shall have identical joint locations within spans. Members shall be divided into pour sections not to exceed 60 feet in length.

2. Construction joints in all concrete elements shall be perpendicular to the planes of their surfaces.

C. Watertight Joints

1. Construction joints in the following locations shall be watertight and shall be provided with continuous waterstops.

a. For liquid-containing structures, provide in slabs below the liquid surface elevation, and in all perimeter walls to their full height.
b. For liquid-containing structures, provide in divider walls where it is possible for one side or "cell" to be out of service while the other remains liquid-containing.
c. For filters and clear water reservoirs, provide in all walls, base slabs, and top slabs.
d. Provide in other locations specifically indicated on the Drawings.

3.2 EXPANSION AND CONTRACTION JOINTS

A. Expansion joint filler shall be firmly bonded to the previously poured joint face with a suitable adhesive, and the new concrete shall be poured directly against the joint filler. Accessible edges of each expansion and contraction joint shall be sealed as specified in the caulking section.

3.3 WATERSTOPS

A. Placement

1. Each waterstop shall be continuous throughout the length of the joint in which it is installed. Waterstops shall be clean, free from coatings, and shall be maintained in proper position until surrounding concrete has been deposited and compacted. Waterstop embedment shall be equal on both sides of the joint.

2. Expandable waterstops shall be located as nearly as possible to the center of the joint and shall not be installed when air temperature falls outside the manufacturer's recommended range.

B. Storage and Handling

1. Expansion joint filler and elastomeric (PVC or TPV) waterstops shall be stored in a cool place protected from direct sunlight.

2. Metal waterstops shall be handled, transported, delivered, and stored in a manner which will prevent bends, dents, or corrosion.

C. Splices

1. Junctions between adjacent sections of metal waterstops shall be lapped 5 inches and securely bolted, screwed, or spot welded together.

2. Junctions between adjacent sections of elastomeric (PVC or TPV) waterstops shall be spliced in strict conformity with the recommendations of the manufacturer. Directional changes and intersections shall be factory fabricated by the waterstop manufacturer prior to delivery to the Site. Field splices will be acceptable only in straight sections.

3. Expandable waterstops shall be contact lapped a minimum distance of 8 inches . Voids shall be filled with sealant.

4. Where an expandable waterstop is used in combination with metal or PVC water stops, the expandable water stop shall be placed in contact and shall overlap a minimum distance of 12 inches . Voids shall be filled with sealant.

3.4 PLACEMENT

A. The limits of each concrete pour shall be determined by Contractor and shall be acceptable to Engineer.

3.5 EMBEDMENTS

A. Anchor bolts, castings, steel shapes, conduits, sleeves, masonry anchors, and other objects that are to be embedded in the concrete shall be accurately positioned in the forms and securely anchored.

B. Unless installed in pipe sleeves, anchor bolts shall have sufficient threads to permit a nut to be placed on the concrete side of the form or template. A second nut shall be placed on the other side of the form or template, and the two nuts shall be so adjusted that the bolt will be held rigidly in proper position.

3.6 PLACEMENT AGAINST SUBGRADE

A. Where concrete is placed against rock, all loose pieces of rock shall be removed and the exposed surface cleaned with a high-pressure water spray.

B. Polyethylene Film

1. Where concrete is placed against gravel or crushed rock which does not contain at least 25 percent material passing a No. 4 sieve, such surfaces shall be covered with polyethylene film. Joints in the film shall be lapped at least 6 inches and taped.

C. Vapor Retarder

1. Vapor retarder shall be installed at the locations indicated on the Drawings. Installation shall be in accordance with ASTM E1643 and the manufacturer’s recommendations.

Joints in the retarder shall be sealed with waterproof sealing tape. Care shall be exercised to avoid tearing or puncturing the retarder. Any damage shall be promptly repaired, and the retarder shall be inspected for damage immediately before the concrete is placed.

3.7 BEARING PADS

A. Wherever a concrete beam is supported by a concrete bracket, a bearing pad shall be placed in the joint between the beam and the bracket. Bearing pads for sliding joints shall be attached to the hardened surface to prevent uplift during subsequent placement of concrete. Nailing of pads shall not be permitted.

End of Section

SECTION 03300 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SCOPE

A. This section covers procurement of all cast-in-place concrete, including concrete materials, limiting requirements, mixture design, and performance requirements, and delivery to the Site through discharge at the end of the delivery truck chute.

B. Work beyond the end of the delivery truck chute is covered in the Concrete Forming, Concrete Joints and Accessories, Concrete Reinforcing, Concrete Placing, Concrete Finishing, and Concrete Curing sections.

C. Both inch-pound (English) and SI (metric) units of measurement are specified herein; the values expressed in inch-pound units shall govern.

1.2 GENERAL

A. All cast-in-place concrete shall conform to the limiting requirements of this specification including Table 1.

B. Concrete Classifications

1. Concrete classifications shall be defined and used as indicated for the following classes:

C. Concrete Classifications

Class	Class Description

A. Structural Concrete

A1. Concrete for Liquid-Containing Structures. Concrete for liquid-containing environmental structures, liquid-containing tanks, interior suspended slabs in high humidity areas, headwalls, chemical storage or containment areas, below grade structures exposed to groundwater under normal conditions, and all other concrete not otherwise indicated.

A2. Small Aggregate Concrete; Congested Areas. Structural small aggregate concrete shall be used in all areas (including liquid-containing structures) where the clear distance between reinforcement, conduit, or embedded items is less than the largest dimension of coarse aggregate particles in the structural concrete.

A3. Concrete for Non-Liquid-Containing Structures. Concrete for footings, foundations, manholes, catch basins, pan-formed joists, and all other structural concrete other than for liquid-containing structures.

A4. Mortar Puddle. Placed in a lift 2 inches or more deep at the bottom of forms for walls and columns immediately before structural concrete is placed.

Class	Class Description
A5.	Drilled Pier Concrete. Not used.

B. Exterior Flatwork Concrete. Concrete for exterior slabs on grade, plant pavement, sidewalks, curbs and gutters, and small equipment pads.

C. Architectural Concrete. Not used.

D. Miscellaneous Concrete

D1. Ductbanks, Pipe Blocking, Concrete Fill, and Pipe Encasement Concrete. Concrete used in ductbanks, pipe blocking, concrete fill and pipe encasements.

D2. Underwater Concrete. Not used.

D3. Mass Concrete. Not used.

D4. Pan Stairs Concrete. Not used.

D5. Wash Water Trough Concrete. Not used.

D6. Composite Topping Concrete. Not used.

D7. Lean Concrete. Not used.

1.3 SUBMITTALS

A. Drawings and Data – General

1. All data shall be submitted in accordance with the Submittal Procedures section, unless otherwise specified herein.

B. Drawings and Data – Required Items

1. The required submittal data for each Class of concrete shall be as indicated in Tables 2A, 2B, and 2C.

C. Preliminary Review of Materials

1. Reports covering the source and quality of concrete materials proposed for the work shall be submitted to Engineer for review within 30 days after the preconstruction conference.

2. The submittal shall include Submittal Cover Page #1, provided in the Appendix of this section. The cover page shall indicate the page numbers in the submittal where the respective data may be found during Engineer review.

3. A manufacturer's certificate of compliance, which includes copies of independent test results confirming compliance with specified requirements, shall be submitted for the following materials:

a. Cement.
b. Admixtures.
c. Slag Cement.

D. Proposed Mixture Proportions

1. Data indicating the proposed material quantities in each Class of concrete shall be submitted to Engineer for review within 30 days after the preconstruction conference.

2. The submittal shall include Submittal Cover Page #2, provided in the Appendix of this section. The cover page shall indicate the page numbers in the submittal where the respective data may be found during Engineer review.

E. Mixture Test Results

1. Concrete mixture test results shall be submitted to Engineer for review and acceptance.

2. The submittal shall include Submittal Cover Page #3, provided in the Appendix of this section. The cover page shall indicate the page numbers in the submittal where the respective data may be found during Engineer review.

3. Compressive strength shall be qualified by field test record data only for the Classes of concrete indicated as such in Table 2C. Compressive strength shall be qualified by laboratory testing for other Classes.

4. Laboratory trial mixture testing shall not begin until materials and proposed mixture proportions have been reviewed and are acceptable to Engineer.

1.4 STORAGE AND HANDLING

A. Cement, slag cement and fly ash shall be stored in suitable moistureproof enclosures. Cement, slag cement and fly ash which have become caked or lumpy shall not be used.

B. Aggregates shall be stored so that segregation and the inclusion of foreign materials are prevented. The bottom 6 inches of aggregate piles in contact with the ground shall not be used.

PART 2 - PRODUCTS

2.1 LIMITING REQUIREMENTS

A. Unless otherwise specified, each concrete mixture shall be designed and controlled, within the following limits, to provide a dense, durable concrete suitable for the expected service conditions.

B. Concrete materials shall be selected and concrete shall be proportioned, batched, mixed, and delivered in a manner that will minimize shrinkage and cracking as specified herein, and in accordance with Chapters 3 and 8 of ACI 224R. Concrete temperatures shall be controlled before and until delivery at the end of the delivery truck chute to minimize cracking. Any rise in concrete temperature caused by environmental conditions that will be conducive to excessive shrinkage shall be controlled.

C. For each class of concrete, each concrete mixture shall be designed and concrete shall be controlled within the limits in the specification and in Table 1.

D. Cementitious Material Content Limits

1. The cementitious material content shall be suitable for meeting the performance requirements of this specification.

2. Contractor may substitute slag cement for cement within the percentage ranges indicted in Table 1 on the basis of 1.0 lbs of slag cement added for each lb of cement reduction.

E. Maximum Water-Cementitious Material Ratio

1. The maximum water-cementitious material ratio shall be on a cement mass basis, or, if fly ash or slag cement is used, the combined mass of cement plus fly ash or slag cement shall be used to determine the water-cementitious materials ratio. Limiting maximum water-cementitious material ratios are indicated in Table 1.

F. Aggregates

1. Aggregates shall comply with ASTM C33 except as specified herein. Recycled aggregates, or aggregates created from crushed concrete, will not be acceptable. Fine aggregate shall be clean natural sand. Artificial or manufactured sand shall not be used unless acceptable to Engineer. Coarse aggregate shall be clean crushed rock, washed gravel, or other inert granular material, meeting Class 4S requirements, except that clay and shale particles shall not exceed values indicated in Table 1.

2. Gradation of coarse aggregate shall conform to maximum nominal size grading requirements of ASTM C33. When a combination of two or more sizes is used, the combined gradation shall meet ASTM C33 requirements.

3. Aggregates used in concrete shall have a combined aggregate distribution similar to the aggregates used in the concrete trial mixtures. Reports of individual aggregates shall include sieve sizes 1-1/2 inch, 1 inch, 3/4 inch, 1/2 inch, 3/8 inch, No. 4, No. 8, No. 16, No. 30, and No. 50 in accordance with ASTM E11.

4. Specified sand equivalent for fine aggregate shall be not less than indicated in Table 1 for an average of 3 samples tested in accordance with ASTM D2419.

5. To comply with the specified concrete shrinkage test requirements, the clay and shale content of the aggregates may need to be reduced by washing the aggregate.

G. Ratio of Fine to Total Aggregates

1. The ratio of fine to total aggregates, based on solid volumes (not weights), shall be as follows:

Maximum Nominal Coarse Aggregate Size	Minimum Ratio	Maximum Ratio
3/8 inch	0.45	0.60
1/2 inch	0.40	0.55

Maximum Nominal Coarse Aggregate Size	Minimum Ratio	Maximum Ratio
3/4 inch	0.35	0.50
1 inch	0.30	0.46
1-1/2 inch	0.25	0.40

H. Slump

1. Concrete slump shall be kept as low as possible, consistent with proper handling and thorough consolidation. Prior to the addition of admixtures, slump shall be at least 2 inches and shall not exceed the maximum slump as indicated in Table 1.

2. When superplasticizer is dispensed at the ready-mix plant, the concrete mixture design shall be based on a maximum slump as indicated in Table 1. When superplasticizer is dispensed at the Site, the slump of the concrete delivered shall not exceed the maximum slump as indicated in Table 1 before superplasticizer is added.

I. Initial Set

1. The initial set, as determined by ASTM C403, shall be attained 5-1/2 hours ±1 hour after the water and cementitious materials are added to the aggregates for each concrete mixture. The quantity of retarding admixture shall be adjusted to compensate for variations in temperature and job conditions.

J. Total Air Content

1. The total volumetric air content of concrete after placement shall be as indicated in Table 1, and within ±1.5 percent. Air-entraining admixture may be omitted from concrete for interior floor surfaces which are to be steel trowel finished.

K. Admixtures

1. Only approved or specified admixtures shall be used.

2. Unless otherwise acceptable to Engineer, all admixtures shall be from one manufacturer and shall be compatible. Admixtures that are compatible with other admixtures and concrete materials shall not have an adverse effect on the required properties of the concrete nor the specified limiting requirements. The admixture content, batching method, and time of introduction to the mixture shall comply with these specifications and with the manufacturer's recommendations for minimum shrinkage. The admixture manufacturer shall provide qualified field services as necessary, at no additional cost to City.

3. Admixtures used in the concrete shall be reviewed and accepted by Engineer prior to conducting the laboratory trial mixture testing and the shrinkage testing. No calcium chloride nor admixture containing chloride from sources other than residual impurities in admixture ingredients will be permitted.

4. Combination of admixtures which cause premature or local dehydration or post-compaction settlement of the concrete surface shall not be used. If any such undesirable

characteristics are observed, the use of the mixture shall be discontinued and an alternate mixture design used.

5. All liquid-containing (Class A1) concrete, and small aggregate (Class A2) concrete that is placed in liquid-containing structures, shall include a high-range water reducing admixture (superplasticizer). Water-reducing admixtures are not required for Classes D1 and D7, but may be included at Contractor's option. For all other non-liquid-containing concrete, a water-reducing admixture shall be used.

6. Superplasticizer may be dispensed into the concrete at the plant or on the Site and shall be mixed in accordance with the admixture manufacturer's recommendations. Each superplasticizer dose, when dispensed at the Site, shall be easily verifiable and recorded on the delivery ticket. The superplasticizer for each load shall be accurately proportioned into a separate container prior to dispensing the admixture into the concrete. When truck-mounted dispensers are used, the system shall not be flushed or cleaned with water until after the entire load of concrete has been discharged. When permitted by Engineer, redosing of concrete with superplasticizer shall be done only once. Redosing procedures shall be as recommended by the admixture manufacturer.

7. A shrinkage reducing admixture may be added to Class A1 concrete. It shall replace an equal volume of mixing water or as otherwise recommended by the admixture manufacturer. The quantity of air entrainment admixture shall be adjusted as required by the admixture manufacturer to keep mixture air content within specified limits.

L. Fiber Concrete

1. Not used.

M. Strength

1. In addition to the other limiting requirements to achieve durability and minimize shrinkage, the minimum acceptable compressive strengths of concrete tested at the end of the delivery truck chute, as determined by ASTM C39, shall be as indicated in Table 1.

2. Adequate test cylinders taken at the point of placement shall also be made to verify that Contractor's concreting procedures comply with applicable industry standard procedures.

N. Pumped Concrete

1. Coarse aggregate size for pumped concrete mixtures shall be limited to a nominal maximum of 1-1/2 inch .

O. Water-Soluble Chloride

1. Maximum water-soluble chloride ion concentrations in hardened concrete at an age of 28 days shall not exceed the limits expressed as a percentage of mass of cementitious materials as indicated in Table 1.

2. Test results shall be reported as the percentage of water-soluble chloride ions in the concrete and as a percentage of chloride ion relative to the mass of cementitious materials in the concrete.

3. Testing of the concrete components for water-soluble chloride ions may be done at the discretion of Contractor. Copies of the reports on such tests shall be furnished to Engineer.

4. The hardened concrete and each gradation of aggregate used in the concrete shall be tested each time a chloride ion test is conducted on a concrete mixture.

P. Laboratory Shrinkage Limits

1. Based on the modified ASTM C157 test procedures as specified herein, the shrinkage limits of concrete shall be the average drying shrinkage of each set of three test specimens cast in the laboratory from a trial mixture as measured at the 21 days drying age, and shall not exceed the values in Table 1.

Q. Cold Weather Concrete

1. Except as modified herein, cold weather concrete shall comply with ACI 306.1. The temperature of concrete at the point of delivery at the end of the delivery truck chute shall be not less than that indicated in ACI 306.1 for corresponding outdoor temperature (in shade) at the time of placement.

2. When delivered, heated concrete shall be not warmer than 80°F .

R. Hot Weather Concrete

1. Except as modified herein, hot weather concrete shall comply with ACI 305.1. At air temperatures of 90° F or above, concrete shall be kept as cool as possible before and during delivery. The temperature of the concrete at the time of delivery at the end of the delivery truck chute shall not exceed the values indicated in Table 1.

2.2 MATERIALS

Cement	ASTM C150 Type I, or ASTM C595 Type IL, Low Alkali, unless high early strength is required in which instance Type III shall be used. ASTM C595 cements that incorporate ASTM C1157 cements will not be acceptable.
Fly Ash	Not permitted.
Slag Cement	ASTM C989, Grade 100 or Grade 120.
Aggregates, Fine and Coarse	As specified in Limiting Requirements paragraph.
Water	Potable. Water from concrete production operations shall not be used.

Admixtures

Water Reducing/Normal Set	ASTM C494, Type A, except as otherwise specified herein.
Water Reducing/Retarding	ASTM C494, Type D, except as otherwise specified herein.
Air-Entraining	ASTM C260.
High Range Water Reducing/Normal Set	ASTM C494, Type F, extended slump life type, except as otherwise specified herein.
High Range Water Reducing/Retarding	ASTM C494, Type G, extended slump life type, except as otherwise specified herein.
Shrinkage Reducing Admixture	GCP Applied Technologies (Grace) “Eclipse 4500,” Euclid “Eucon SRA,” or Master Builders Solutions “MasterLife SRA 035.” These admixtures shall not be used when NSF/ANSI 61 certification is required.

2.3 MIXTURE DESIGN AND TESTING

A. As stipulated in the Quality Control section, all reports and tests required for preliminary review of materials and for laboratory trial mixtures shall be made by an independent testing laboratory at the expense of Contractor. Mixtures shall be adjusted in the field as necessary, within the limits specified, to meet the requirements of these specifications. If the source of any concrete materials is changed during the contract, concrete work shall pause until the new materials and the new mixture design are tested in accordance with the specified requirements.

B. Preliminary Review of Materials

1. The tests and reports required shall be as indicated in Table 2A. Review of these reports shall be for general acceptability only, and continued compliance with all contract provisions shall be required.

2. Aggregate reports shall be no more than 90 days old at time of submittal.

3. Alkali-aggregate reactivity potential shall be determined by one of the following procedures. Field performance history as described in ASTM C1778 will not be an acceptable method for qualifying aggregates.

   a. Test fine and coarse aggregates in accordance with ASTM C1260. Aggregates which are classified as innocuous may be used without further testing.
   b. Test fine and coarse aggregates in accordance with ASTM C1567, using a single aggregate with all cementitious materials selected for the Project. The fine and coarse aggregates shall not be combined and used in a single test. This test may only be used for mixtures that contain slag cement or fly ash, and those products shall not have an alkali content greater than 4.0 percent sodium oxide equivalent. Combinations of cementitious materials and aggregate which do not indicate a potential for alkali reactivity may be used without further testing. Mixture

combinations which indicate a potential for alkali reactivity shall have the ingredients and/or proportions modified and then the test shall be repeated.

c. Test fine and coarse aggregates in accordance with ASTM C1293. Concrete mixtures containing only cement (without pozzolan or slag cement) shall be tested accordingly and have a measured expansion of 0.04 percent or less at one year duration. Concrete mixtures containing pozzolan or slag cement shall be tested with those ingredients in proportions matching that of the proposed mixture, and shall have a measured expansion of 0.04 percent or less at two years duration.

C. Proposed Mixture Proportions

1. Proposed proportions for each Class of concrete shall meet the limiting requirements indicated herein.

D. Mixture Testing

1. Test results on each Class of concrete shall be submitted for review and shall be acceptable to Engineer before concrete work is started. The reports shall include the information indicated in Table 2C.

2. Field Test Record Data

a. If indicated as acceptable in Table 2C, concrete mixtures may be qualified based upon field test record performance data in lieu of laboratory trial mixtures. Field test data records shall be from the production facility being used on the current Project and shall have been performed in the past 24 months. Field test records shall represent a single group of at least 10 consecutive strength tests for one mixture, using the same materials, under the same conditions, and encompassing a period of not less than 45 days.

3. Laboratory Trial Mixture Testing

a. Trial mixtures shall be tested in the laboratory for each size and combined gradation of aggregates and for each consistency as indicated and intended for use on the work and as specified.

b. Concrete ingredients shall be measured and mixed in the laboratory. Concrete test specimens shall be made, cured, and stored in accordance with ASTM C192 and tested in accordance with ASTM C39.

c. Concrete proportions shall be established based on laboratory trial mixtures that meet the following requirements:

1) The combination of materials shall be as proposed for use in the work.

2) Mixtures shall conform with the limiting requirements specified herein.

3) The required average compressive strength, f'_{cr}, of the trial mixture shall exceed the specified minimum acceptable compressive strength, f'_{cr}, as required in Table 1.

4) Trial mixtures of the proportions and consistencies specified for the work shall be prepared. When a three point curve is required by Table 2C, the three concrete trial mixtures shall reflect the cement content proposed for the Project and for the indicated concrete class at three water-cementitious material ratio contents at or lower than indicated in Table 1. The compressive

strength of the cylinders made from the three trial mixtures shall produce a range of compressive strengths exceeding or encompassing the f'_{cr} required for the work.

5) For each proposed concrete mixture that is required to be tested as indicated in Table 2C, compressive strength test cylinders shall be made for each testing age. Each change in the water-cementitious materials ratio shall be considered a new concrete mixture. Each mixture shall be tested at the ages of 7 days and 28 days.

6) When a three point curve is required in Table 2C, the results of the cylinder tests for each water-cementitious materials ratio at each age shall be plotted as a curve showing the relationship between compressive strength (along y-axis) and the water-cementitious materials ratio (along x-axis). The water-cementitious materials ratio and the associated average compressive strength for the Project concrete mixture shall be selected from the 28 day curve. The maximum water-cementitious materials ratio specified in the limiting requirements shall still apply even if the curve indicates that the concrete strength would be adequate at a higher ratio. The cement content and mixture proportions to be used shall be such that the selected water-cementitious materials ratio will not be exceeded at specified maximum slump. These concrete mixture proportions shall be submitted for review in accordance with the Submittals Procedures section.

7) When a shrinkage reducing admixture is proposed, trial mixtures shall be prepared with and without the shrinkage reducing admixture.

4. Testing Procedures

a. Concrete mixture testing procedures shall be as specifier herein, and reports for these tests shall be prepared specifically for this Project.

b. Aggregates shall be sampled and tested in accordance with ASTM C33. The bulk specific gravity of each aggregate shall be determined in accordance with ASTM C127 and ASTM C128.

c. Slump shall be determined in accordance with ASTM C143. Unit weight (mass) shall be determined in accordance with ASTM C138. Total air content shall be determined in accordance with ASTM C231 and verified in accordance with ASTM C138. Concrete temperature shall be determined in accordance with ASTM C1064.

d. Initial set tests shall be made at ambient temperatures of 70° F and 90° F to determine compliance with the specified time for initial set. The test at 70° F shall be made using concrete containing the specified normal set/water-reducing admixture and, when required, air-entraining admixture. The test at 90° F shall be made using concrete containing the specified retarding/water-reducing admixture and, when required, air-entraining admixture. Initial set shall be determined in accordance with ASTM C403.

e. Cylinders shall be 6 inches diameter by 12 inches high for concrete mixes using a maximum nominal aggregate size of 1 inch or larger. Cylinders may be either 6 inches diameter by 12 inches high, or 4 inches diameter by 8 inches high for concrete mixes using a maximum nominal aggregate size of less than 1 inch . The average compressive strength shall be determined from the results of at least three cylinders when using 4 inch diameter cylinders, and at least two cylinders

when using 6 inch diameter cylinders. All tests for a particular class of concrete shall be performed using the same sized cylinders for the duration of the work.

f. Water-soluble chloride ion shall be determined in accordance with ASTM C1218.

g. A drying shrinkage test shall be conducted on the trial mixture with the maximum water-cementitious materials ratio used to qualify each proposed concrete mixture design using the concrete materials, including admixtures, that are proposed for the Project. Three test specimens shall be prepared for each test. Drying shrinkage specimens shall be 4 inch by 4 inch by 11 inch prisms with an effective gauge length of 10 inches , fabricated, cured, dried, and measured in accordance with ASTM C157 except with the following modifications:

1) Specimens shall be removed from the molds at an age of 23 hours ±1 hour after batching, shall be placed immediately in water at 73°F ±3°F for at least 30 minutes, and shall be measured within 30 minutes thereafter to determine original length and then submerged in lime-saturated water as specified in ASTM C157. Measurement to determine expansion expressed as a percentage of original length shall be taken at age 7 days. The length at 7 days shall be the base length for drying shrinkage calculations ("zero" days drying age). Specimens then shall be stored immediately in a humidity controlled room maintained at 73°F ±3°F and 50 percent ±4 percent relative humidity for the remainder of the test. Measurements to determine shrinkage expressed as a percentage of the base length shall be reported separately for 7, 14, and 21 days ±4 hours of drying from "zero" days after 7 days of moist curing for a total of 28 days from the date of casting.

2) Drying shrinkage deformation for each specimen shall be computed as the difference between the base length (at "zero" days drying age) and the length after drying at each test age. Results of the shrinkage test shall be reported to the nearest 0.001 percent. If drying shrinkage of any specimen deviates from the average for that test age by more than 0.004 percent, the results for that specimen shall be disregarded.

3) The average drying shrinkage of each set of 4 inch by 4 inch by 11 inch test specimens made in the laboratory from a trial mixture shall not exceed the values required in Table 1.

PART 3 - EXECUTION

3.1 BATCHING, MIXING, AND DELIVERY

A. Concrete shall be furnished by an acceptable ready-mixed concrete supplier, and shall conform to ASTM C94 except as indicated otherwise in this specification. The time from start of concrete mixing to completion of discharge from the truck shall not exceed 1-1/2 hours.

B. Delivery Tickets

1. A delivery ticket shall be prepared for each load of ready-mixed concrete and a copy of the ticket shall be handed to Engineer by the truck operator at the time of delivery. Tickets shall indicate the name and location of Contractor, the project name, the mixture identification, the quantity of concrete delivered, the quantity of each material in the batch,

the outdoor temperature in the shade, the time at which the cementitious materials were added, and the numerical sequence of the delivery.

C. Mixing Water

1. Mixing water shall not be added in transit. Any amount of water withheld from the truck mixer shall be clearly indicated on the delivery ticket. Water added at the site shall not exceed the amount withheld, and shall not be added without oversight by City's on site inspector.

D. Consistency

1. The consistency of concrete shall be suitable for the placement conditions. Aggregates shall flow uniformly throughout the mass, and the concrete shall flow sluggishly when vibrated or spaded. The slump shall be kept uniform.

3.2 City'S FIELD CONTROL TESTING

A. Field control tests, including slump, air content, and making compression test cylinders, shall be performed by Engineer or City's testing laboratory personnel, at the expense of City. Contractor shall provide access to all facilities and the services of one or more employees as necessary to assist with the field control testing.

B. The frequency specified herein for each field control test is approximate and subject to change as determined by Engineer.

C. Engineer may require field testing prior to the addition of superplasticizer at the Site to determine compliance with the specifications. Field testing after the addition of superplasticizer shall be conducted as specified and as needed to determine that the concrete is in compliance with the specifications. Air content tests shall be conducted whenever field tests are conducted.

D. Slump

1. A slump test shall be made for each 100 cubic yards of concrete. Slump shall be determined in accordance with ASTM C143.

E. Air Content

1. An air content test shall be made on concrete from one of the first three batches mixed each day and on concrete from each batch of concrete from which concrete compression test cylinders are made. Air content shall be determined in accordance with ASTM C231 and verified in accordance with ASTM C138.

F. Unit Weight

1. A unit weight test shall be made on concrete from each batch of concrete from which concrete compression test cylinders are made. Unit weight shall be determined in accordance with ASTM C138.

G. Concrete Temperature

1. A concrete temperature test shall be made on concrete from the first batch of concrete mixed each day and on concrete from each batch of concrete from which concrete compression test cylinders are made. During hot or cold weather concreting operations, temperature shall be checked not less than once per hour. Concrete temperature shall be determined in accordance with ASTM C1064.

H. Water-Soluble Chloride Ion

1. Water-soluble chloride ion testing shall be performed once for each 1,000 cubic yards of concrete in accordance with ASTM C1218

I. Compression Tests

1. One set of concrete compression test cylinders shall be made not less than once each day concrete is placed, not less than once for each 100 cubic yards of each class of concrete, and not less than once for each 5000 square feet of surface area for slabs or walls. Half of the cylinders of each set shall be tested at an age of 7 days and the remaining cylinders shall be tested at an age of 28 days.

2. Test cylinders shall be made, cured (standard curing method), stored, and delivered to the laboratory in accordance with ASTM C31 and tested in accordance with ASTM C39.

3. Cylinders shall be 6 inches diameter by 12 inches high for concrete mixes using a maximum nominal aggregate size of 1 inch or larger. Cylinders may be either 6 inches diameter by 12 inches high, or 4 inches diameter by 8 inches high for concrete mixes using a maximum nominal aggregate size of less than 1 inch . The average compressive strength shall be determined from the results of at least three cylinders when using 4 inch diameter cylinders, and at least two cylinders when using 6 inch diameter cylinders. All tests for a particular mixture class shall be performed using the same sized cylinders for the duration of the work and shall match the cylinder size used for the trial mixtures.

4. Each set of compression test cylinders shall be marked or tagged with the date and time of day the cylinders were made, the location in the work where the concrete represented by the cylinders was placed, the number of the delivery truck or batch, the air content, the slump, the unit weight, and the concrete temperature.

J. Shrinkage Tests

1. Concrete shrinkage tests shall be performed once for each 1,000 cubic yards of concrete with controlled shrinkage that is placed and shall be made on concrete from a batch of concrete from which concrete compression test cylinders are made. Shrinkage testing shall be conducted as specified for the preliminary trial mixtures.

2. The average drying shrinkage of each set of test specimens cast in the field from concrete delivered to the Site and sampled at the end of the delivery truck chute, as measured at the 21 days drying age, shall not exceed the values indicated in Table 1.

K. Test Reports

1. Five copies of each test report shall be prepared and distributed by the testing laboratory to the City, Resident Project Representative (two copies), Engineer, and Contractor, in accordance with the Quality Control section.

3.3 EVALUATION AND ACCEPTANCE OF CONCRETE

A. Concrete will be evaluated for compliance with all requirements of the specifications. Concrete strength will be only one of the criteria used for evaluation and acceptance of the concrete. The results of all tests performed on the concrete and other data and information concerning the procedures for handling, placing, and curing concrete will be used to evaluate the concrete for compliance with the specified requirements.

B. Compression tests will be evaluated in accordance with ACI 318 and as specified herein. A strength test shall be the average of the compressive strengths of two 6 inch diameter cylinders or three 4 inch diameter cylinders, made from the same concrete sample tested at 28 days.

C. Compression Test Evaluation

1. Compressive strength test results will be evaluated for compliance with the specified strength requirements. The strength level of the concrete will be considered satisfactory when the averages of all sets of three consecutive strength tests equal or exceed the specified compressive strength, f'_c, and no individual strength test result falls below the specified compressive strength by more than 500 psi .

D. Inspection of Concrete Supplier

1. Both scheduled and unscheduled visits by inspectors on days of concrete pours shall be accommodated. Inspectors shall be allowed access to delivery tickets and mixture proportions.

TABLE 1 – LIMITING REQUIREMENTS															
	Concrete Class	**A1**	**A2**	**A3**	**A4**	**A5**	**B**	**C**	**D1**	**D2**	**D3**	**D4**	**D5**	**D6**	**D7**
1.	Compressive Strength, minimum; psi														
	Field, 7 days;	3375	3375	3375	3000		3000		2250						
	Field, 28 days; f'_c	4500	4500	4500	4000		4000		3000						
	Laboratory, 28 days; f'_{cr}	5700	5700	5700	5200		5200		3200						
2.	Maximum water-cementitious material ratio	0.42	0.42	0.45	0.45		0.48		0.65						
3.	Maximum nominal coarse aggregate size, inches	1	1/2	1-1/2	Sand		1-1/2		1						
4.	Maximum slump, inches														
	Slump before super-plasticizer added	3	3	4	6		4		5						
	Slump after adding superplasticizer	8	8	8	8		8		8						
5.	Total air content, percent, (± 1.5 %)	6	7.5	6	6		6		---						
6.	Fly ash replacement, percent range														
7.	Slag cement replacement, percent range	25-50	25-50	25-50	0		25-30		25-50						
8	Testing limits														
	Sand equivalent, min. percent	75	75	75	75		75		---						
	Chloride ion, max. percent	0.08	0.08	0.15	0.08		0.15		0.30						
	Shrinkage, max. percent; based 4 x 4 x 11 inch specimen														
	Laboratory	0.036	0.036	0.048	---		0.048		---						
	Field	0.048	0.048	0.064	---		0.064		---						

TABLE 1 – LIMITING REQUIREMENTS														
	Concrete Class	**A1**	**A2**	**A3**	**A4**	**A5**	**B**	**C**	**D1**	**D2**	**D3**	**D4**	**D5**	**D6**	**D7**
	Coarse Aggregate: Clay and shale combined particles shall not exceed, max. percent	1	1	1	1		3		10						
9	Concrete temperature at time of delivery and placement, max. ° F	85	85	90	85		95		95						

TABLE 2A – SUBMITTAL REQUIREMENTS (PRELIMINARY REVIEW OF MATERIALS)														
	Concrete Class	**A1**	**A2**	**A3**	**A4**	**A5**	**B**	**C**	**D1**	**D2**	**D3**	**D4**	**D5**	**D6**	**D7**
1	Aggregate reports														
	Fine aggregate														
	Source and type	X	X	X	X		X		X						
	Gradation	X	X	X	X		X		X						
	Deleterious materials	X	X	X	X		X		X						
	Fineness modulus	X	X	X	X		X		---						
	Alkali-aggregate reactivity	X	X	X	X		X		X						
	Sand equivalent	X	X	X	X		X		---						
	Coarse aggregate														
	Source and type	X	X	X	---		X		X						
	Gradation	X	X	X	---		X		X						
	Deleterious materials	X	X	X	---		X		X						
	Abrasion loss	X	X	X	---		X		---						
	Soundness test	X	X	X	---		X		---						
	Alkali-aggregate reactivity	X	X	X	---		X		X						
	Combined aggregate gradation	X	X	X	---		X		X						
2	Cement, mill report	X	X	X	X		X		X						
3	Cementitious material, type, data sheet, and test report (fly ash, slag cement)	X	X	X	X		X		X						
4	Admixtures														
	Data sheets and certifications	X	X	X	X		X		X						
	Manufacturer’s approval letter	X	X	X	X		X		X						
5	NSF/ANSI 61 compliance, for each proposed concrete constituent, where applicable														

TABLE 2B – SUBMITTAL REQUIREMENTS (PROPOSED MIXTURE PROPORTIONS)														
	Concrete Class	**A1**	**A2**	**A3**	**A4**	**A5**	**B**	**C**	**D1**	**D2**	**D3**	**D4**	**D5**	**D6**	**D7**
6	Mixture proportions, reports	X	X	X	X		X		X						

TABLE 2C – SUBMITTAL REQUIREMENTS (MIXTURE TESTING)														
	Concrete Class	**A1**	**A2**	**A3**	**A4**	**A5**	**B**	**C**	**D1**	**D2**	**D3**	**D4**	**D5**	**D6**	**D7**
7	Type of testing														
	Field test records acceptable	---	---	---	---		---		X						
	Trial mixtures required	X	X	X	X		X		---						
8	Test Reports Required														
	Confirmation of materials tested														
	Cement brand, type, composition, quantity	X	X	X	X		X		X						
	Fly ash brand, type, composition, quantity	X	X	X	X		X		X						
	Specific gravity of each aggregate	X	X	X	X		X		X						
	Ratio of fine to total aggregates	X	X	X	---		X		---						
	Water content	X	X	X	X		X		X						
	Water-cementitious materials ratio	X	X	X	X		X		X						
	Slump	X	X	X	X		X		---						
	Unit weight	X	X	X	---		X		---						
	Air content	X	X	X	---		X		---						
	Temperature	X	X	X	X		X		---						
	Time of initial set at 70° F and 90° F.	X	X	X	X		X		---						
	Three point curves	X	X	X	---		---		---						
	Compressive strength at 7 and 28 days	X	X	X	X		X		X						
	Water-soluble chloride ion	X	X	X	X		X		X						

TABLE 2C – SUBMITTAL REQUIREMENTS (MIXTURE TESTING)														
	Concrete Class	**A1**	**A2**	**A3**	**A4**	**A5**	**B**	**C**	**D1**	**D2**	**D3**	**D4**	**D5**	**D6**	**D7**
	Drying shrinkage	X	X	X	---		X		---						

Appendix – Submittal Cover Pages

Submittal Cover Page #1 – Preliminary Review of Materials	
Subject	Insert Submittal Page Number(s)
FINE AGGREGATE REPORTS	
Source and Type	
Gradation	
Deleterious Materials	
Fineness Modulus	
Alkali-Aggregate Reactivity	
Sand Equivalent	
COARSE AGGREGATE REPORTS	
Source and Type	
Gradation	
Deleterious Materials	
Abrasion Loss	
Soundness Test	
Alkali-Aggregate Reactivity	
Combined Aggregate Gradation	
CEMENTITIOUS MATERIAL REPORTS	
Cement Mill Report	
Fly Ash Report	
Slag Report	
ADMIXTURES	
Data Sheets and Certifications	
Manufacturer’s Approval Letter	

Submittal Cover Page #2 – Proposed Mixture Proportions																
	Insert Submittal Page Number(s)															
Subject	A1	A2	A3	A4	A5	A6	A7	B	C	D1	D2	D3	D4	D5	D6	D7
Water-Cementitious Material Ratio																
Ratio of Fine-to-Total Aggregates				---						---						

Submittal Cover Page #3 – Mixture Test Results														
	Insert Submittal Page Number(s)													
Subject	A1	A2	A3	A4	A5	B	C	D1	D2	D3	D4	D5	D6	D7
Slump (pre HRWR)								---						
Slump (after HRWR)								---						
Unit Weight				---				---						
Air Content				---				---						
Temperature								---						
Time of Set								---						
Lab Compressive Strength (7 days)								---						
Lab Compressive Strength (28 days)								---						
Three point curves				---		---		---						
Field Compressive Strength (28 days)	---	---	---	---		---								
Water-soluble chloride														
Shrinkage				---				---						
ANSI/NSF 61														

End of Section

SECTION 03330 - CONCRETE PLACING

PART 1 - GENERAL

1.1 SCOPE

A. This section covers placing of cast-in-place concrete.

B. Both inch-pound (English) and SI (metric) units of measurement are specified herein; the values in inch-pound units govern.

1.2 GENERAL

A. All cast-in-place concrete shall be properly placed as indicated on the Drawings and as specified herein.

1.3 SUBMITTALS

A. Drawings and Data

1. All submittals of test data, manufacturers' certificates of compliance, reports, catalog data sheets and other data shall be in accordance with the Submittal Procedures section.

B. Manufacturer's Certificate of Compliance

1. A manufacturer's certificate of compliance, which includes the name of the project and, when requested, copies of independent test results confirming compliance with specified requirements, shall be submitted to Engineer for the following materials:

a. Epoxy bonding agent.

PART 2 - PRODUCTS

2.1 LIMITING REQUIREMENTS

A. Concrete shall be handled and placed in a manner that will minimize shrinkage and cracking as specified herein. Concrete temperatures shall be controlled both before and after placement to minimize cracking.

2.2 MATERIALS

Epoxy Bonding Agent	ASTM C881, Type V, moisture insensitive, 100 percent solids; Dayton Superior "Sure Bond J58," Euclid "Dural 452 MV," Prime Resins "Prime Bond 3900 High Mod LPL," or SpecChem "SpecPoxy 2000."
	'SIKA LIQUED WELD' Concrete and plaster bonding agent

PART 3 - EXECUTION

3.1 RECEIVING

A. Contractor shall check each delivery ticket to verify the concrete class delivered to the jobsite is in compliance with the concrete requested and is suitable for Contractor's handling, placing, finishing, and curing procedures. Engineer will collect the delivery tickets from the truck operator.

3.2 PLACEMENT

A. The limits of each concrete pour shall be determined by Contractor and shall be acceptable to Engineer. All concrete within the predetermined limits shall be placed in one continuous operation.

B. Before concrete is placed, forms, reinforcement, water stops, anchor bolts, and embedments shall be rigidly secured in proper position; all dirt, mud, water, and debris shall be removed from the space to be occupied by concrete; all surfaces encrusted with dried concrete from previous placements shall be cleaned; and the entire installation shall be acceptable to Engineer. Remove all frost, ice, and snow from within the formwork before concrete is placed.

C. Contractor shall inform Engineer at least 24 hours in advance of any concrete placement.

D. Bonding to Hardened Concrete

1. The surface of hardened concrete upon which fresh concrete is to be placed shall be rough, clean, sound, and damp. Before placement of plastic concrete, the hardened surface shall be cleaned of all laitance and foreign substances (including curing compound), washed with clean water, wetted thoroughly, and the surface made free of standing water. Surface profile of the hardened concrete after surface preparation shall be as required for good bond.

2. Epoxy bonding agent shall only be required where specifically indicated on the project drawings or specifications. Fresh concrete shall be applied when bonding agent is still tacky. Bonding agent material that has exceeded the manufacturer's recommended pot life shall be removed.

3. Coarse aggregate shall be omitted from the first batch or batches of concrete placed on hardened concrete in wall or column forms. The mortar puddle, Class A4 concrete, shall cover the hardened concrete by at least 2 inches at every point.

E. Conveying Concrete

1. Methods of conveying concrete to the point of final deposit shall prevent segregation or loss of ingredients. After placement in the forms, concrete shall not be moved laterally more than 5 feet . Concrete's free fall should not exceed 4 feet .

F. Pumping Concrete

1. The slump of concrete, with or without a superplasticizer, which is discharged into the pump may exceed the specified maximum slump value by the amount of slump loss in the pumping system, up to a maximum of 1 inch . The slump loss shall be determined by tests made at each end of the pumping system. If tests indicate a slump loss greater than 1 inch in the pumping system, Contractor shall modify the pumping system as required to reduce the slump loss to 1 inch or less.

G. Placing Concrete

1. For proper compaction, concrete shall be placed in approximately horizontal layers not to exceed 24 inches . Each layer of concrete shall be plastic when covered with the following layer, and the rate of vertical rise of the concrete in the forms shall not be less than 24 inches per hour. Vertical construction joints shall be provided as necessary to comply with these requirements.

2. Concrete shall be placed and compacted in wall or column forms before any reinforcement is placed in the system to be supported by such walls or columns. The height of any portion of a wall or column placed monolithically with a floor or roof slab shall not exceed 6 feet . Concrete in walls or columns shall have achieved initial set before concrete is placed in the structural systems to be supported by such walls or columns.

3. Concrete shall be thoroughly settled in wall forms before top finishing. All laitance, debris, and surplus water shall be removed from concrete surfaces at tops of forms by screeding, scraping, or other effective means. Wherever the top of a wall will be exposed to weathering, the forms shall be overfilled and after the concrete has settled, the excess shall be screeded off.

H. Compaction

1. During and immediately after placement, concrete shall be thoroughly compacted and worked around all reinforcement and embedments and into the corners of the forms. Mechanical vibrators shall maintain at least 14,000 cycles per minute when immersed in the concrete. The number and type of vibrators shall be acceptable to Engineer. The use of “jitterbug” tampers to compact concrete flatwork will not be permitted.

I. Cold Weather Concreting

1. Except as modified herein, cold weather concreting shall comply with ACI 306.1.

2. Massive embedded items identified on the drawings shall be above 32° F when the concrete is placed.

3. When placed, heated concrete shall not be warmer than 80° F.

J. Hot Weather Concreting

1. Except as modified herein, hot weather concreting shall comply with ACI 305.1.

2. At air temperatures of 90° F or above, concrete shall be kept as cool as practicable during placement. The temperature of the concrete when placed in the work shall not exceed the values indicated in the Cast-in-Place Concrete section.

3. Plastic shrinkage cracking due to rapid evaporation of moisture shall be prevented. Concrete shall not be placed when the evaporation rate (actual or anticipated) equals or exceeds 0.2 lb per square foot per hour, as determined using the nomograph in Appendix A of ACI 305.1.

3.3 COMPOSITE TOPPING CONCRETE

A. Not used.

3.4 CLEANING EMBEDMENTS

A. Embedments shall be clean when installed.

End of Section

SECTION 03350 - CONCRETE FINISHING

PART 1 - GENERAL

1.1 SCOPE

A. This section covers finishing of cast-in-place concrete.

B. Both inch-pound (English) and SI (metric) units of measurement are specified herein; the values in inch-pound units govern.

1.2 GENERAL

A. All cast-in-place concrete shall be properly finished as indicated on the Drawings and as specified herein.

1.3 SUBMITTALS

A. Drawings and Data

1. All submittals of test data, manufacturers' certificates of compliance, reports, catalog data sheets and other data shall be in accordance with the Submittal Procedures section.

B. Manufacturer's Certificate of Compliance

1. A manufacturer's certificate of compliance, which includes the name of the project and, when requested, copies of independent test results confirming compliance with specified requirements, shall be submitted to Engineer for the following materials:

a. Floor sealer.

PART 2 - PRODUCTS

2.1 MATERIALS

Concrete Surface Coloring/Hardener	Mineral aggregate dry-shake colored hardener for concrete flatwork. ChemSystems, Inc. "CSI Color Hardener," Euclid "Surflex," or Dayton Superior "Quartz Tuff."
Evaporation Reducer	Dayton Superior "AquaFilm Concentrate J74," Euclid "Eucobar," L&M Chemical "E-Con," Master Builders Solutions "MasterKure ER50," or Sika "SikaFilm."

Nonslip Aggregate	Aluminum oxide aggregate, L&M Chemical “Grip It,” Master Builders Solutions “MasterTop 120SR,” or Dayton Superior “Emery Non-Slip.”
Floor Sealer	ASTM C1315, Type I, Class A, minimum 25 percent solids, acrylic, non-yellowing, unit moisture loss 0.40 kg/m^2 maximum in 72 hours. Product shall not exceed VOC limits established by the federal, state, or local regulatory agency having jurisdiction over the project site.

PART 3 - EXECUTION

3.1 FINISHING UNFORMED SURFACES

A. Buried and permanently submerged concrete blocking and encasement will require no finishing except as necessary to obtain the required surface elevations or contours. The unformed surfaces of all other concrete shall be screeded and given an initial float finish followed by additional floating, and troweling where required.

B. Screeding

1. Screeding shall produce a concrete surface conforming to the proper elevation and contour, with all aggregates completely embedded in mortar.

C. Application of Evaporation Reducer

1. Concrete flatwork subject to rapid evaporation due to hot weather, drying winds, and sunlight shall be protected with an evaporation reducer. The evaporation reducer shall form a continuous film on the surface of fresh, plastic concrete to reduce evaporation.

2. Immediately following screeding, evaporation reducer shall be sprayed over the entire surface of fresh, plastic concrete flatwork at a rate of not less than 200 square feet per gallon , in accordance with the manufacturer’s recommendations. The spray equipment shall have sufficient capacity to continuously spray the product at approximately 40 psi with a suitable nozzle as recommended by the manufacturer.

3. The sprayable solution shall be prepared as recommended by the manufacturer.

4. Under severe drying conditions, additional applications of evaporation reducer may be required following each floating or troweling, except the last finishing operation.

D. Floating

1. 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.

2. Initial floating shall be followed by a second floating at the time of initial set. The second floating shall produce a finish of uniform texture and color, and unless additional finishing is specifically required, shall produce the completed finish for unformed surfaces.

3. Floating shall be done with hand floats or suitable mechanical compactor-floats.

E. Finishing Surfaces for Bonding

1. All surfaces to be covered with concrete or topping shall be float finished. All laitance, surface mortar, and unsound material shall be removed by brushing or air blasting at the time of initial set. Surfaces shall be rough, clean, and sound. Floors and other flat surfaces to receive composite topping (Class D6) shall be given a broom finish or raked finish with at least a 1/4 inch profile.

F. Troweling

1. Interior floor surfaces which will be exposed after construction is completed; surfaces to be covered with resilient floor coverings, thinset terrazzo, or seamless floor covering; exposed top surfaces of equipment bases and interior curbs; and other surfaces designated on the Drawings shall be steel trowel finished. Surfaces to be covered with elastomeric deck covering shall be lightly troweled but not burnished. Trowel finishing will not be required for floors which are normally submerged. Troweling shall be performed after the second floating when the surface has hardened sufficiently to prevent an excess of fines being drawn to the surface. Troweling shall produce a dense, smooth, uniform surface free from blemishes and trowel marks.

2. Air-entraining admixture may be omitted from concrete for interior floor surfaces which are to be steel trowel finished.

G. Edging

1. Unless specified to be beveled, exposed edges of floated or troweled surfaces shall be edged with a tool having at least a 1/8 inch corner radius.

H. Pavement Finishing

1. The surface of pavements shall not vary more than 1/8 inch under a 10 foot straightedge placed parallel to the center line.

2. Following placement and consolidation, and the disappearance of bleed water, the concrete surface shall be broom finished with a broom acceptable to Engineer. The broom shall be not less than 18 inches wide and made from good quality bass or bassine fibers not more than 5 inches long. The broom finishing shall produce regular corrugations not over 1/8 inch deep. The broom shall be pulled square across the surface, from edge to edge, with adjacent strokes slightly overlapped, and shall not tear the concrete surface.

I. Curb and Gutter 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 at least 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 type broom.

J. Sidewalk Finishing

1. Concrete surfaces 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. Initial floating shall be followed by a second floating at the time of initial set.

2. Floated surfaces shall be given a light broom finish, using a horsehair broom, to provide a nonslip surface. Brooming shall be done at right angles to the length of the walk.

3. Sidewalks shall be edged using a 3 or 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. 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.

4. The finished surface of all sidewalks shall be neat in appearance, shall be sloped to drain, and shall not pond water.

3.2 FLOOR SEALER

1. All concrete floors in interior locations which are to remain as exposed concrete or will be covered with carpet shall be given two coats of clear floor sealer in addition to any which may have been applied as a membrane curing compound. Floor sealer shall not be applied to concrete floors that are to be stained or etched, covered with chemical resistant linings, covered with additional concrete, or indicated in the Architectural drawings to be covered with a finish flooring material. Prior to application of each coat of sealer, the floor shall be thoroughly cleaned of dirt, grease, and other foreign matter. The first coat shall be applied at the end of the curing period. The second coat shall be applied in preparation for substantial completion of the work. Floor sealer shall be applied in accordance with the manufacturer’s recommendations.

3.3 REPAIRING DEFECTIVE CONCRETE

A. Defective concrete shall be defined as any surface with undesirable visible effects in excess of that permitted by the relevant formed concrete surface category (CSC), except as indicated otherwise herein.

B. Defects in formed concrete surfaces shall be repaired to the satisfaction of Engineer within 24 hours of form removal. Surface repair work shall conform to Article 5.3.7 of ACI 301 and shall be performed in a manner that will not interfere with thorough curing of the surrounding concrete. Surface repair material shall be adequately cured.

C. Defects in concrete that are more than 3 inches deep shall be brought to the attention of Engineer prior to any repair work. Contractor shall submit a proposed repair material and procedure for review by Engineer. The repair material and procedure required by Engineer may be more extensive than the process described in Article 5.3.7 of ACI 301.

3.4 FINISHING FORMED SURFACES

A. Formed concrete surfaces shall meet all criteria of the relevant formed concrete surface category (CSC), as defined in ACI 347.3R, except as indicated otherwise herein. Surfaces shall be assigned to CSCs as indicated.

B.

Formed Concrete Surface Category	Applicable Surfaces	Mockup Required
CSC1	Formed concrete surfaces that will be in permanent contact with earth backfill.	No
CSC2	All other formed concrete surfaces not designated otherwise.	No
CSC3	None.	Yes
CSC4	None.	Yes

C. Fins, form seams, and construction joints shall be ground flush on all surfaces in formed concrete surface categories CSC2, CSC3, and CSC4, and in CSC1 surfaces that are required to be dampproofed.

D. All tie holes in formed surfaces, regardless of the relevant CSC, shall be cleaned, wetted, and filled with patching mortar. The patches shall be finished flush and cured and shall match the texture and color of the adjacent concrete.

E. Concrete surfaces to be dampproofed shall have fins removed and tie holes filled, but no additional finishing will be required.

F. Concrete surfaces to be painted or grout cleaned shall have sharp edges and projections removed to provide an acceptable condition for painting or grout cleaning. The concrete surfaces shall have bug holes filled per the Protective Coatings section.

G. Mockups

1. Not used.

3.5 TOLERANCES

A. Tolerances for cast-in-place concrete work shall be as stipulated in ACI 117, unless otherwise indicated.

B. Settling Basin Tolerance

1. Settling basin floors shall be accurately finished to a uniform slope, and shall be within 1 inch of the shape indicated on the Drawings.

C. Flat Member Mounting Tolerances

1. Formed concrete surfaces that are to have a face-mounted flat steel or FRP member attached, including but not limited to items such as weir plates or shelf angles, shall have a profile that permits the installation of the flat member without grinding the concrete surface (except for removal of fins), deforming the flat member, or requiring usage of backer rods or shims.

3.6 COMPOSITE TOPPING CONCRETE

A. Not used.

3.7 CLEANING EMBEDMENTS

A. After placement of concrete, surfaces of embedments not in contact with concrete shall be cleaned of concrete spatter and other foreign substances.

End of Section

SECTION 03370 – SANITARY SEWER MANHOLE CONSTRUCTION

PART 1 - GENERAL

1.01 SUMMARY

A. This section covers the construction of standard sanitary sewer manholes. Standard manholes shall be constructed complete with frame and cover, anchors, waterproofing, seals, barriers, joint sealant, fittings and all other specified requirements in accordance with the Contract Documents.

1.02 SPECIFICATION MODIFICATIONS

A. It is understood that throughout this section, these Specifications may be modified by appropriate items in Section 01015 – Specific Project Requirements or as otherwise indicated on the Contract Drawings.

1.03 RELATED SECTIONS

A. Section 01015 – Specific Project Requirements.
B. Section 01300 – Submittals.
C. Section 02200 – Earthwork.
D. Section 02250 – Trenching, Pipe Embedment and Backfill.
E. Section 02702 – Sewer Pipe and Manhole Testing.
F. Section 03000 – Miscellaneous Concrete.
G. Section 05010 – Sanitary Sewer Manhole Castings.

1.04 CODES AND STANDARDS

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.
B. American Society for Testing and Materials (ASTM):

ASTM A185	Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
ASTM A536	Standard Specification for Ductile Iron Castings.
ASTM A615	Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
ASTM C76	Standard Specification for Reinforced Concrete Culvert, Storm Drain and Sewer Pipe.
ASTM C109	Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens).
ASTM C191	Standard Test Methods for Time of Setting of Hydraulic Cement by Vicat Needle.
ASTM C443	Standard Specification for Joints for Circular Pipe and Manholes, Using Rubber Gaskets.
ASTM C478	Standard Specification for Circular Precast Reinforced Concrete Manhole Sections.
ASTM C827	Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures.
ASTM C923	Standard Specification for Resilient Connectors between Reinforced Concrete Manhole Structures, Pipes and Laterals.
ASTM C990	Standard Specification for Joints for Concrete Pipe, Manholes and Precast Box Sections Using Preformed Flexible Joint Sealants.

ASTM C1107	Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Non-shrink).
ASTM D4976	Standard Specification for Polyethylene Plastics Molding and Extrusion Materials.

1.05 DEFINITIONS

A. Paved Areas – Areas for which the final surfacing will be street pavement, shoulders, driveways, parking lots, sidewalks, gravel roads or other surface features.
B. Unpaved Areas – Areas for which the final surfacing is a green space.

1.06 INFORMATION PROVIDED BY THE CITY

A. As provided in the Contract Documents.

1.07 SUBMITTALS

A. Submit as specified in Section 01300 – Submittals.
B. Shop Drawings:
    1. Submit for approval general arrangement drawings showing manhole size, height and location of access cover, steps and all pipe penetrations.
    2. Submit for approval joint construction details.
    3. Submit for approval details on reinforcement if requested.
C. Product Data:
    1. Submit for review and approval manufacturer's catalogue/product data and installation instructions for the following:
        (a) Manhole adjustment rings.
        (b) Resilient connectors.
        (c) Joint sealant.
        (d) External joint seal.
        (e) Internal joint seal.
        (f) External frame chimney seal.
        (g) Grade ring liner.
        (h) Non-shrink grout.
        (i) Antimicrobial additive.
        (j) Waterproofing additive.
        (k) Color tinting additive.
D. Certificates:
    1. Certification from precast manufacturer that the precast structures were fabricated to include the specified antimicrobial additive, admixture identifier and waterproofing additives.
E. Other:
    1. Precast concrete mix design.
    2. Compressive strength testing of cylinders.
    3. Compressive strength testing of cores.

1.08 QUALITY ASSURANCE

A. The Contractor is responsible for the quality assurance and quality control of the Work.
B. The installation contractor shall be a licensed underground utility contractor licensed for such work in the state of Missouri. The installing contractor's license shall be current and be state certified/state registered.

C. Manufacturers of all precast concrete structures must be a KCMO "Approved Precast Concrete Product Supplier" as approved as part of the Public Works Quality Management Plan.

1.09 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Cement, Aggregate and Reinforcement shall be in accordance with Section 03000 – Miscellaneous Concrete and as specified herein.
B. Handle materials and other accessories in such manner as to ensure delivery to the trench in a sound undamaged condition. Take special care not to damage linings. If the lining is damaged, the Contractor shall make satisfactory repairs.
C. Non-shrink grout – Deliver materials to project in Manufacturer's original, unopened packaging, with labels clearly identifying product name, manufacturer and expiration date. Store grout in a cool, dry place, out of the sun.
D. Precast concrete sections shall not be delivered to the job until the concrete control cylinders have attained a strength of at least 80 percent of the specified minimum.
E. Precast concrete sections shall be handled carefully and shall not be bumped or dropped. Hooks shall not be permitted to come in contact with joint sections.
F. Precast concrete sections shall be inspected when delivered. All cracked and visibly defective units shall be rejected. City/Design Professional reserves the right to inspect the production of the units at the manufacturing plant.

1.10 MANHOLE TYPES

A. Unless otherwise noted on the Drawings or in Section 01015 – Specific Project Requirements, all manhole types shall conform to the following:
   1. Standard Precast Manhole – Eccentric Cone: Use for all newly constructed manholes having a depth (measured from top of casting to top of base) of more than 6 feet. See Standard Drawing 03370-1.
   2. Standard Precast Manhole – Shallow Type: Use for all newly constructed manholes having a depth (measured from top of casting to top of base) of less than or equal to than 6 feet. See Standard Drawing 03370-2.

PART 2 - PRODUCTS

2.01 PRECAST CONCRETE

A. Materials and Fabrication:
   1. Precast concrete shall conform to ASTM C478.
   2. Air entraining agents shall be added to the concrete to provide 4 to 6 percent entrained air.
   3. Submit for review and approval the precast concrete manufacture's mix design(s) for precast structures.

B. Quality Control:
   1. Compressive Testing of Cylinders – Conduct in accordance with ASTM C478. Provide compressive testing results as requested by the City/Design Professional or as required by Section 01015 – Specific Project Requirements.
   2. Compression Testing of Cores – Conduct in accordance with ASTM C478 and submit results as requested by the City/Design Professional and as required by Section 01015 – Specific Project Requirements.

2.02 MANHOLES

A. The minimum inside diameter of the manhole shall be as follows:

Table 1. Minimum Manhole Diameter

Sewer Pipe Size (inches)	**Manhole Inside Diameter** (inches)	**Min. Manhole Frame Clear Opening** (inches)
Up to 36" (inch)	60"	30"
42"(inch) through 48"(inch)	72" See Standard Drawing 03370-3	30"

B. Reducing sections may be used at six (6) feet or more above the invert.
C. Cone Sections shall be eccentric, unless otherwise specified by City/Design Professional.
D. All required pipe openings shall be plant cast, unless otherwise noted.
E. Pre-cast sections may be provided with lifting notches on the inside faces of the walls to facilitate handling. Lifting notches shall be not more than 3 inches deep. Holes extending through the wall will not be acceptable.
F. If precast base sections are provided with integral concrete invert fill, a roughened surface shall be provided to improve the bond with the final invert fill. A minimum of 2 inches of the concrete invert fill shall be installed in the field.

2.03 MANHOLE ADJUSTMENT RINGS

A. Adjusting rings shall be designed to withstand the wheel loading requirements of AASHTO HS25.
B. Adjusting rings shall be designed and fabricated to withstand deterioration and degradation when exposed to hydrogen sulfide.
C. Acceptable Manufacturers include:
   1. Cretex Pro Ring.
   2. East Jordan (EJ) Infrariser.
   3. LadTech.

2.04 RESILIENT CONNECTORS

A. Manholes shall be provided with circular openings, with continuous, circular, resilient connectors cast into the wall.
B. Resilient connectors shall be installed in accordance with the manufacturer's recommendations, except that connectors shall be positioned so that sealing or resealing operations may be accomplished from inside the manhole.
C. Resilient connectors shall conform to ASTM C923.
D. Mortar connections will be allowed only if prior approval has been given by the City/Design Professional.
E. Acceptable Products/Manufacturer's include the following:
   1. The PSX: Direct Drive as manufactured by Press-Seal Corporation:
      (a) When the PSX: Direct Drive connector is used, it shall be double banded and the take-up screws for the gasket clamps shall be positioned 180 degrees apart.

2. The Quik-LOK Connector as manufactured by A-LOK Products Inc.:
   (a) When the Quik-LOK connector is used, it shall be double banded and the take-up screws for the gasket clamps shall be positioned 180 degrees apart.

2.05 JOINT SEALANT

A. Joints shall be sealed using preformed flexible joint sealants conforming to ASTM C990. The minimum bead dimension shall be one inch.
B. Install in accordance with manufacturer's recommendations.

2.06 EXTERNAL JOINT SEAL

A. External manhole seals shall be installed on new manhole installations, replacements or when project conditions allow for excavation of the manhole sections.
B. External joint seals shall be a minimum of 9 inches wide.
C. Heat Shrinkable Wrap-around Sleeves: Acceptable products include the following:
   1. CCI Pipeline Systems: WrapidSealTM.
D. External Joint Banding Systems:
   1. Infi-Shield®: External Gator Wrap.
   2. Mar Mac Construction Products, Inc.: MacWrap External Sealing Band.
   3. Cretex Specialty Products: Cretex Wrap.
E. Standard Precast Manhole – Shallow Type:
   1. Install an internal Cretex Seal or Infi-Shield Uni-Band External Seal where the chimney meets the flat top of manholes.
F. Materials for manhole seals shall be able to withstand hydrogen sulfide and other corrosive gases found in sewers.
G. Install in accordance with manufacturer's recommendations.

2.07 INTERNAL JOINT SEAL

A. Internal manhole seals shall be used when project conditions prevent the use of external manhole seals or at the direction of the City/Design Professional.
B. Acceptable products for internal manhole seal shall include the following:
   1. Cretex – Internal Joint Seal.
C. Materials for manhole seals shall be able to withstand hydrogen sulfide and other corrosive gases found in sewers.
D. Install in accordance with manufacturer's recommendations.

2.08 EXTERNAL FRAME CHIMNEY SEAL

A. Acceptable manufacturers for external frame chimney seal include the following:
   1. CCI Pipeline Systems – Wrapid Seal.
   2. Infi-Shield – Gator Wrap.
   3. Infi-Shield – Uniband.
B. Install in accordance with manufacturer's recommendations.

2.09 GRADE RING LINER

A. Grade ring liners shall be installed on all manholes in paved applications.
B. Acceptable manufacturers for grade ring liners include the following:
   1. WaterLOK Grade Ring Liners as manufactured by A-LOK Products, Inc.
   2. I&I Barriers as manufactured by Strike Tool Inc.
C. Install in accordance with manufacturer's recommendations.

2.10 FRAMES, COVERS AND GRATINGS FOR MANHOLES

A. Shall conform to Section 05010 – Sanitary Sewer Manhole Castings.

2.11 NON-SHRINK GROUT

A. Non-shrink grout shall conform to ASTM C1107, Grades B and C.
B. Non-shrink grout shall be a trowelable mix, in the plastic state and show no expansion after set (as tested per ASTM C827). Non-shrink grout shall develop a compressive strength not less than three thousand (3,000) psi within twenty-four (24) hours per ASTM C109. The placement time shall be not less than forty-five (45) minutes based on initial set per ASTM C191.
C. Non-shrink grout shall be ConShield Joint Set as manufactured by ConShield Technologies Inc. Mix and apply in accordance with the manufacturer's recommendations.

2.12 ANTIMICROBIAL ADDITIVE

A. Unless otherwise specified in Section 01015 – Specific Project Requirements, an antimicrobial additive shall be included in the following:
    1. Precast concrete sections.
    2. Miscellaneous concrete placed in the interior of the manhole.
    3. Non-shrink grout placed in the interior of the manhole.
    4. Precast concrete base.
    5. Concrete used for cast-in-place concrete base.
B. Acceptable manufacturers include the following:
    1. ConShield HD® as manufactured by ConShield Technologies Inc.
    2. As specified in Section 01015 – Specific Project Requirements.
C. Admixture Identifier – Color tinting shall be included to identify that the concrete contains the antimicrobial admixture. The identifier shall be CONTINT and shall be brown in color.

2.13 WATERPROOFING ADDITIVE

A. A waterproofing additive shall be included in the following:
    1. Precast concrete manholes and manhole bases.
    2. Non-shrink grout placed in the interior of a manhole
    3. Miscellaneous concrete placed in the interior of a manhole
    4. Concrete used for cast-in-place concrete base
B. Acceptable manufacturers include the following:
    1. Crystal-X as manufactured by ConShield Technologies.
    2. Xypex as manufactured by Xypex Chemical.
    3. As specified in Section 01015 – Specific Project Requirements.

2.14 GRANULAR BEDDING MATERIAL

A. Granular bedding material shall be as specified in Section 02250 – Trenching, Pipe Embedment and Backfill.

2.15 MISCELLANEOUS CONCRETE

A. Miscellaneous concrete shall conform to Section 03000 – Miscellaneous Concrete.

PART 3 - EXECUTION

3.01 EXCAVATION, BACKFILL AND COMPACTION

A. Excavation, backfill and compaction for manholes shall be in accordance with Section 02200 – Earthwork.
B. Excavation, backfill and compaction operation shall be achieved in a suitable and orderly manner providing a minimum disturbance to the general public.
C. Depth of excavation shall be to that required for proper installation of the manhole or structure. Over-depth excavation may be required if the subgrade is unsuitable or unstable. Over-depth excavation due to unsuitable or unstable subgrades shall be backfilled as required by the City/Design Professional. Over-depth excavation occurring through an oversight by the Contractor shall be backfilled as required by the City/Design Professional at no additional cost to the City.
D. Side clearance outside the manhole and/or structures shall be no greater than necessary to allow for forming, connection of piping, proper application of special coatings and access for inspection.

3.02 MANHOLE BASE

A. Precast Concrete Bases:
    1. The bottom precast wall section shall not be used for supporting or leveling the other wall sections prior to pouring the base.
    2. The subgrade materials shall be excavated to undisturbed earth and a uniform elevation to allow for a minimum of 4 inches of granular bedding material. The surface of the granular material shall be carefully graded and the base section accurately set so that connecting pipes will be on the proper line and grade. The elevation of the granular material shall be adjusted as required until proper grade and alignment of the base section has been attained.
    3. No wedging or blocking under precast concrete bases is permitted.
B. Cast-in-Place Concrete Bases:
    1. If a precast concrete base cannot be used, a poured concrete base may be used.
    2. The cast-in-place forming shall follow the design of the precast base as shown in Standard Drawing 03370-1 and as described herein.
    3. Cast-in-place concrete bases shall have a minimum thickness of eight (8) inches.
    4. Concrete shall be placed on undisturbed earth in accordance with requirements of Section 03000 – Miscellaneous Concrete.
    5. The bottom wall section shall be embedded in the base section a minimum of four (4) inches.
    6. Concrete blocks shall be used for supporting or leveling the bottom wall section prior to pouring the base. Use of Wood blocks will not be accepted.
    7. When resilient connectors are used with cast-in-place bases, granular bedding material shall be used instead of concrete fill under the connecting pipes. Granular bedding material shall be place on undisturbed earth.

3.03 MANHOLE INVERTS

A. In no case shall the invert section through a manhole be greater than that of the outgoing pipe.
B. The shape of the invert shall conform exactly to the lower half of the pipe it connects.
C. Side branches shall be connected with as large radius of curve as practicable.
D. All inverts shall be troweled to a smooth, even surface.
E. Inverts shall be constructed of be concrete as specified in Section 03000 –Miscellaneous Concrete.

F. Concrete shall be troweled (or formed if inverts are pre-cast) to produce a dense, smooth finish.
G. The invert channel shall be "U" shaped in cross section and shall extend upward as shown in Standard Drawing 03370-1.
H. Smooth transitions shall be formed for pipes of different sizes, elevation and bends.

3.04 RISER AND CONE SECTIONS

A. Circular precast sections shall be provided with a double bead of preformed flexible joint sealant as specified in paragraph JOINT SEALANT between precast sections.
B. All protruding flexible joint sealant shall be removed from inside of manhole and the joint shall be wiped with non-shrink grout - ConShield Joint Set (see paragraph 2.11).
C. Internal or external manhole joint seals shall be installed per manufacturer's recommendation.
D. Lifting notches in manhole walls shall be filled with non-shrink grout - ConShield Joint Set (see paragraph 2.11).

3.05 PIPE CONNECTIONS

A. Resilient Connectors:
   1. Resilient connectors shall be used for all pipe connections unless otherwise approved by the City.
   2. The connecting pipe shall be carefully adjusted to proper line and grade. Granular 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 manhole wall and to the trench width.
   3. The pipe shall be installed in the resilient connector prior to backfilling outside the manhole and shall be resealed as required after completion of the manhole and backfill. All visible leakage shall be eliminated.
   4. The connecting pipe for installation with resilient connectors shall be plain end, square cut spigots and shall not protrude more than one inch inside the manhole wall.
   5. A clear distance of at least 1 inch from the end of each connecting pipe and around the pipe shall be provided when the concrete invert fill is installed or as recommended by the manufacturer of the resilient connector.
   6. After completion of the manhole installation, the box out shall be filled with mastic filler material, completely filling the space beneath the pipe and extending to at least the spring line. The filler material shall provide a smooth, uniform surface between the inside diameter of the pipe and manhole invert.
B. Grouted Connections:
   1. Grouted connections are not allowed unless approved by the City.
   2. The space between connecting piping and the wall of the precast sections shall be completely filled with non-shrink grout.
   3. The maximum allowable pipe opening on a horizontal axis shall be the outside diameter of the pipe plus twelve (12) inches.
   4. The maximum allowable pipe opening on a vertical axis shall be the outside diameter plus 8 inches.
   5. The minimum clearance between the outside surface of the installed pipe and the concrete of the manhole shall be two (2) inches.
   6. The minimum distance between any two adjacent pipes shall be twelve (12) inches.
   7. For field alterations approved by the City/Design Professional, the walls shall be scored with a masonry saw to a depth sufficient to sever the reinforcing steel. A chipping hammer may then be used to remove the concrete.

3.06 MANHOLE TOP

A. The finished top elevation of manhole castings shall conform to the following unless otherwise shown on the Drawings or directed by the City/Design Professional.
   1. In paved areas, the top of the casting shall conform to the slope of the pavement and shall match the finished pavement elevation as shown in Standard Drawing 03370-4.
   2. In non-pavement areas, the top of the casting shall be not more than one (1) inch above the surrounding ground.
   3. In remote non-paved areas such as along creeks, open fields or wooded areas, the top of the casting shall be eighteen (18) inches above finish grade. Place soil around the casting with a maximum slope of 2 feet vertical to 1 foot horizontal to protect the external manhole seal.

3.07 FRAMES AND CHIMNEYS

A. All manholes shall be constructed with an external frame chimney seal as shown on Standard Drawing 03370-1 and as specified herein.

3.08 GRADE RING LINERS

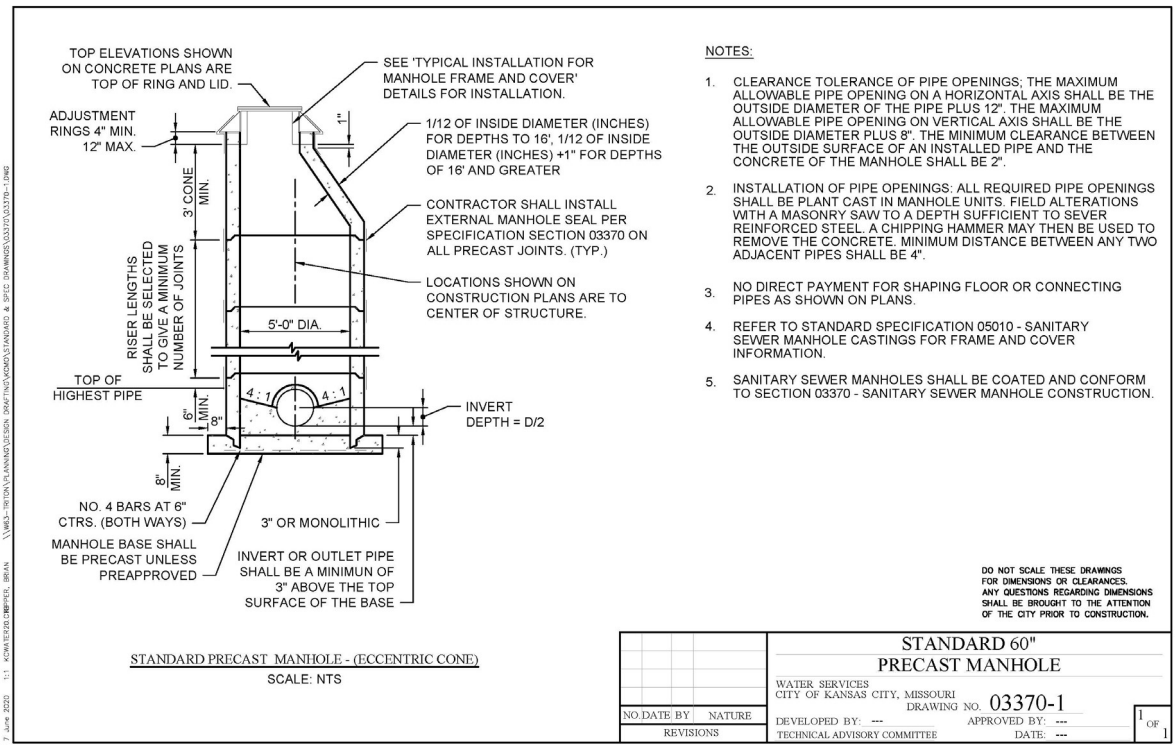
A. All manholes constructed in paved areas shall be installed with a grade ring liner.

3.09 MANHOLE ADJUSTMENT

A. Adjust as shown in Standard Drawing 03370-5.
B. All manholes will shall be provided with adjustment ring(s) to facilitate adjustment:
   1. The manhole shall be provided with adjustment ring. The minimum adjustment for lowering the top of the manhole is 4 inches.
   2. The maximum adjustment for raising the top of the manhole is 12 inches.
C. If the top of an existing manhole is required to be raised to an elevation which will exceed twelve (12) inches or lowered more than the adjustment rings will allow, all vertical adjustments shall be made to the barrel of the manhole.
D. The joints shall be sealed with a double bead preformed flexible joint sealant as specified in 2.04.

3.10 MANHOLE TESTING.

A. The Contractor shall visually verify the absence of leaks and perform a vacuum test, on manholes that have inlet and outlet pipes of less than 42 inches in diameter, in accordance with Section 02702 -Sewer Pipe and Manhole Testing.



STANDARD PRECAST MANHOLE - (ECCENTRIC CONE)
SCALE: NTS

NOTES:

1. CLEARANCE TOLERANCE OF PIPE OPENINGS; THE MAXIMUM ALLOWABLE PIPE OPENING ON A HORIZONTAL AXIS SHALL BE THE OUTSIDE DIAMETER OF THE PIPE PLUS 12". THE MAXIMUM ALLOWABLE PIPE OPENING ON VERTICAL AXIS SHALL BE THE OUTSIDE DIAMETER PLUS 8". THE MINIMUM CLEARANCE BETWEEN THE OUTSIDE SURFACE OF AN INSTALLED PIPE AND THE CONCRETE OF THE MANHOLE SHALL BE 2".
2. INSTALLATION OF PIPE OPENINGS: ALL REQUIRED PIPE OPENINGS SHALL BE PLANT CAST IN MANHOLE UNITS. FIELD ALTERATIONS WITH A MASONRY SAW TO A DEPTH SUFFICIENT TO SEVER REINFORCED STEEL. A CHIPPING HAMMER MAY THEN BE USED TO REMOVE THE CONCRETE. MINIMUM DISTANCE BETWEEN ANY TWO ADJACENT PIPES SHALL BE 4".
3. NO DIRECT PAYMENT FOR SHAPING FLOOR OR CONNECTING PIPES AS SHOWN ON PLANS.
4. REFER TO STANDARD SPECIFICATION 05010 - SANITARY SEWER MANHOLE CASTINGS FOR FRAME AND COVER INFORMATION.
5. SANITARY SEWER MANHOLES SHALL BE COATED AND CONFORM TO SECTION 03370 - SANITARY SEWER MANHOLE CONSTRUCTION.

DO NOT SCALE THESE DRAWINGS FOR DIMENSIONS OR CLEARANCES. ANY QUESTIONS REGARDING DIMENSIONS SHALL BE BROUGHT TO THE ATTENTION OF THE CITY PRIOR TO CONSTRUCTION.

NO.	DATE	BY	NATURE
REVISIONS			

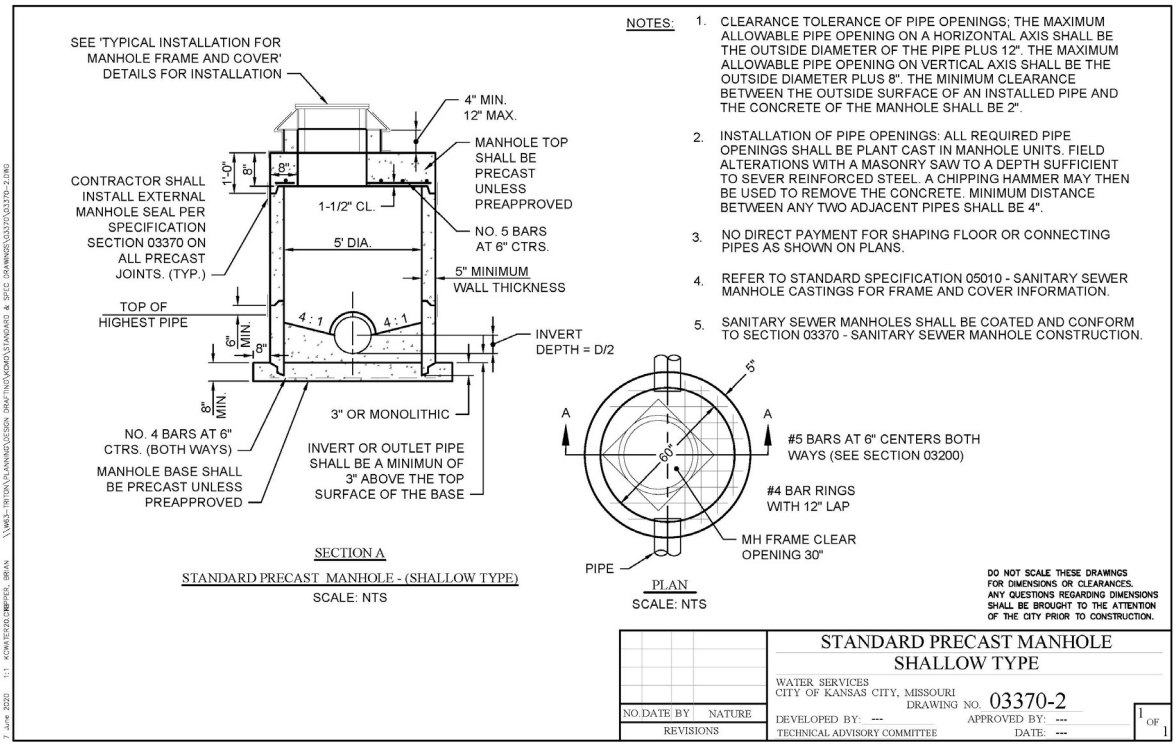
STANDARD 60" PRECAST MANHOLE

WATER SERVICES
CITY OF KANSAS CITY, MISSOURI
DRAWING NO. 03370-1

DEVELOPED BY: ---
APPROVED BY: ---
TECHNICAL ADVISORY COMMITTEE
DATE: ---

1 OF 1

Standard Drawing 03370-1



SECTION A

STANDARD PRECAST MANHOLE - (SHALLOW TYPE)
SCALE: NTS

PLAN
SCALE: NTS

NOTES:

1. CLEARANCE TOLERANCE OF PIPE OPENINGS; THE MAXIMUM ALLOWABLE PIPE OPENING ON A HORIZONTAL AXIS SHALL BE THE OUTSIDE DIAMETER OF THE PIPE PLUS 12". THE MAXIMUM ALLOWABLE PIPE OPENING ON VERTICAL AXIS SHALL BE THE OUTSIDE DIAMETER PLUS 8". THE MINIMUM CLEARANCE BETWEEN THE OUTSIDE SURFACE OF AN INSTALLED PIPE AND THE CONCRETE OF THE MANHOLE SHALL BE 2".
2. INSTALLATION OF PIPE OPENINGS: ALL REQUIRED PIPE OPENINGS SHALL BE PLANT CAST IN MANHOLE UNITS. FIELD ALTERATIONS WITH A MASONRY SAW TO A DEPTH SUFFICIENT TO SEVER REINFORCED STEEL. A CHIPPING HAMMER MAY THEN BE USED TO REMOVE THE CONCRETE. MINIMUM DISTANCE BETWEEN ANY TWO ADJACENT PIPES SHALL BE 4".
3. NO DIRECT PAYMENT FOR SHAPING FLOOR OR CONNECTING PIPES AS SHOWN ON PLANS.
4. REFER TO STANDARD SPECIFICATION 05010 - SANITARY SEWER MANHOLE CASTINGS FOR FRAME AND COVER INFORMATION.
5. SANITARY SEWER MANHOLES SHALL BE COATED AND CONFORM TO SECTION 03370 - SANITARY SEWER MANHOLE CONSTRUCTION.

DO NOT SCALE THESE DRAWINGS FOR DIMENSIONS OR CLEARANCES. ANY QUESTIONS REGARDING DIMENSIONS SHALL BE BROUGHT TO THE ATTENTION OF THE CITY PRIOR TO CONSTRUCTION.

NO.	DATE	BY	NATURE
REVISIONS			

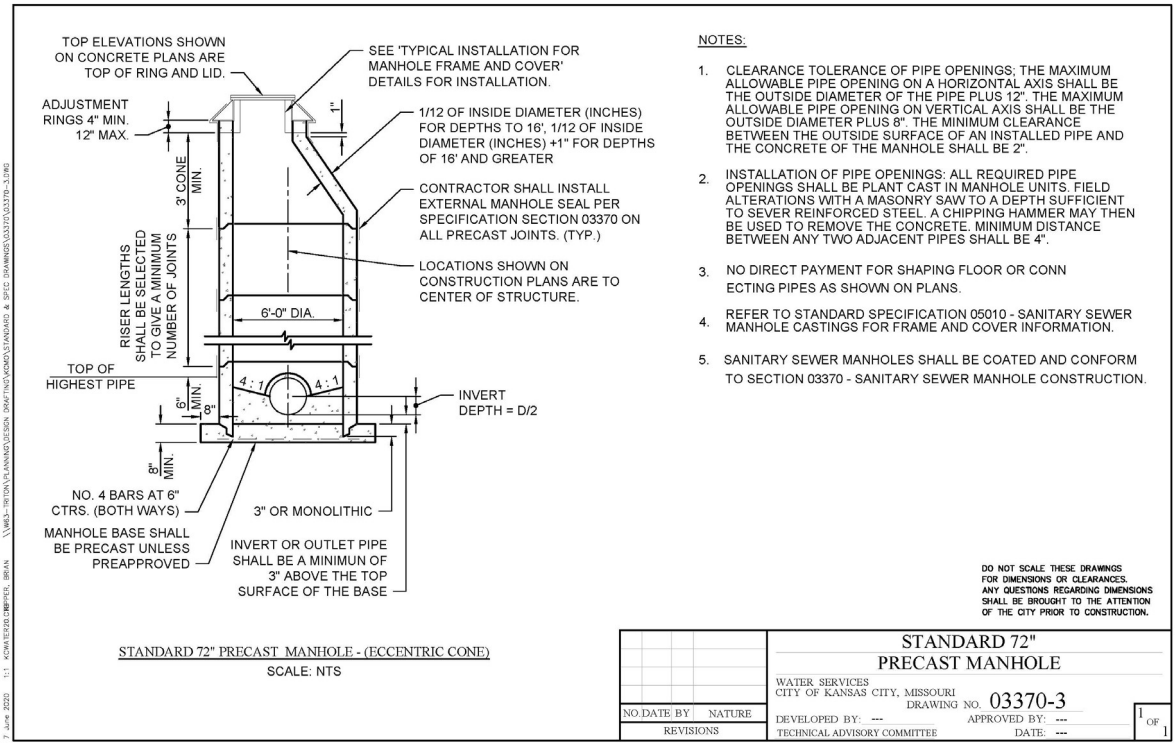
STANDARD PRECAST MANHOLE SHALLOW TYPE

WATER SERVICES
CITY OF KANSAS CITY, MISSOURI
DRAWING NO. 03370-2

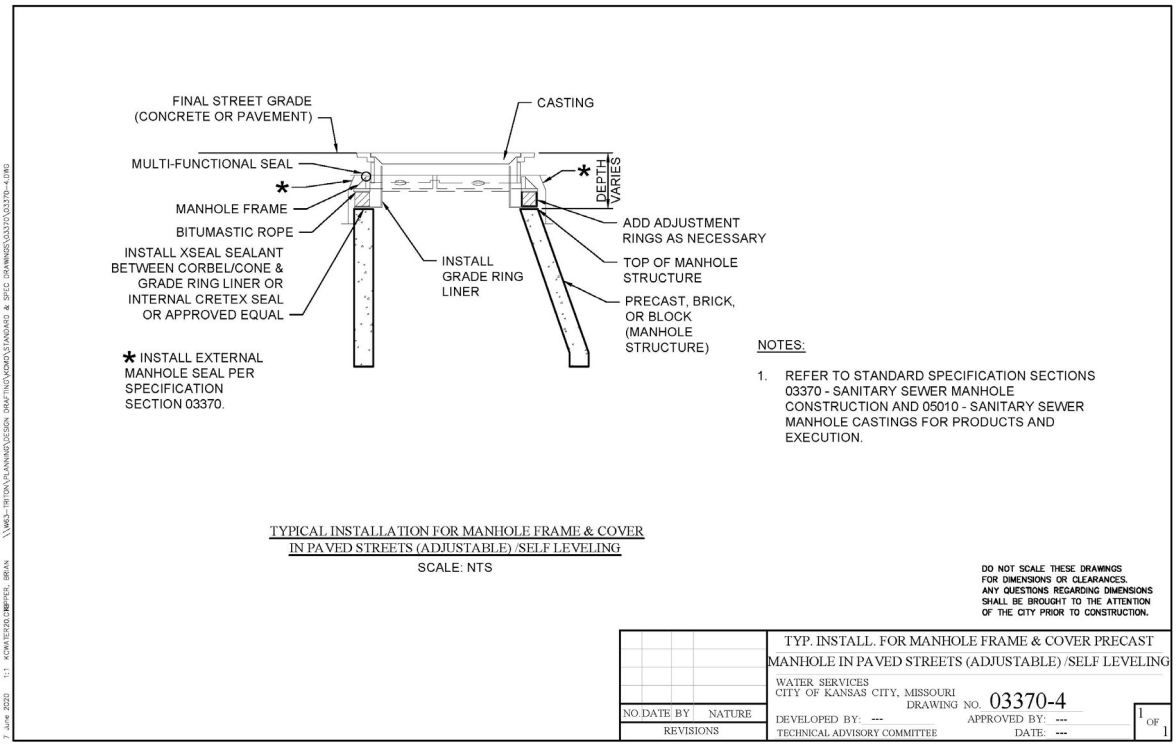
DEVELOPED BY: ---
APPROVED BY: ---
TECHNICAL ADVISORY COMMITTEE
DATE: ---

1 OF 1

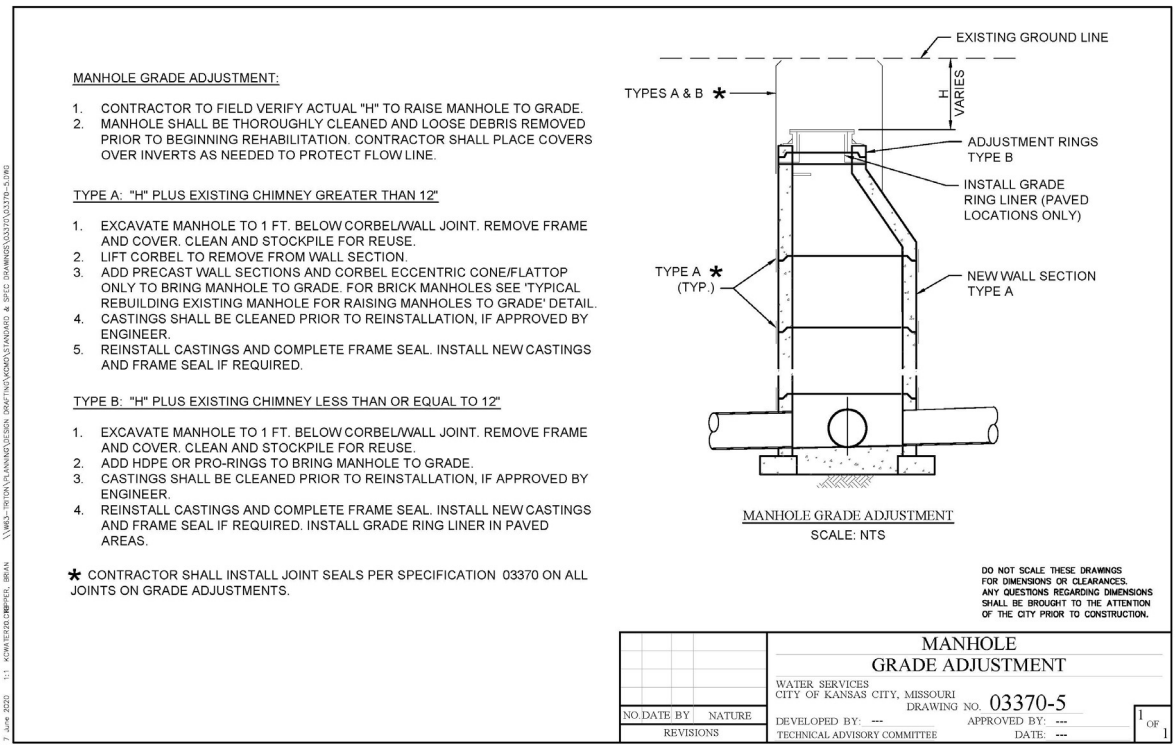
Standard Drawing 03370-2



Standard Drawing 03370-3



Standard Drawing 03370-4



Standard Drawing 03370-5

END OF SECTION

SECTION 03390 - CONCRETE CURING

PART 1 - GENERAL

1.1 SCOPE

A. This section covers curing of cast-in-place concrete.

B. Both inch-pound (English) and SI (metric) units of measurement are specified herein; the values in inch-pound units govern.

1.2 GENERAL

A. All cast-in-place concrete shall be properly cured as indicated on the Drawings and as specified herein.

1.3 SUBMITTALS

A. Drawings and Data

1. All submittals of test data, manufacturers' certificates of compliance, reports, catalog data sheets and other data shall be in accordance with the Submittal Procedures section.

B. Manufacturer's Certificate of Compliance

1. A manufacturer's certificate of compliance, which includes the name of the project and, when requested, copies of independent test results confirming compliance with specified requirements, shall be submitted to Engineer for the following materials:

a. Membrane curing compound.

C. Curing Plan

1. A curing plan shall be submitted for review, indicating the planned method of curing for each individual structure on the project.

PART 2 - PRODUCTS

2.1 LIMITING REQUIREMENTS

A. Concrete shall be cured in a manner that will minimize shrinkage and cracking as specified herein.

2.2 MATERIALS

Membrane Curing Compound	ASTM C1315, Type I, Class A, minimum 25 percent solids, acrylic, non-yellowing, unit moisture loss 0.40 kg/m^2 maximum in 72 hours. Product shall not exceed VOC limits established by the federal, state, or local regulatory agency having jurisdiction over the project site.

PART 3 - EXECUTION

3.1 GENERAL

A. Cold Weather Concreting

1. Except as modified herein, cold weather concreting shall comply with ACI 306.1.

2. The concrete surface shall be maintained at a temperature of at least 50° F for 5 days or 70° F for 3 days, after placement. Concrete temperature shall be recorded at least six times for each 24 hour period. Concrete and adjacent form surfaces shall be kept continuously moist. Sudden cooling of concrete shall not be permitted.

B. Hot Weather Concreting

1. Except as modified herein, hot weather concreting shall comply with ACI 305.1.

2. At air temperatures of 90° F or above, concrete shall be kept as cool as practicable during curing.

3. Plastic shrinkage cracking due to rapid evaporation of moisture shall be prevented.

3.2 CURING

A. Concrete shall be protected from loss of moisture for at least 7 days after placement unless indicated otherwise. Curing of concrete shall be done by methods which will keep the concrete surfaces adequately wet for the specified curing period.

B. Water Curing

1. Water curing shall be performed for concrete in liquid-containing structures and for all concrete containing slag cement. Other forms of curing will not be acceptable in these applications. Water curing shall be in accordance with ACI 308.1 except as modified herein.

2. Water saturation of concrete surfaces shall begin as soon as possible after initial set. The rate of water application shall be regulated to provide complete surface coverage with a minimum of runoff. The application of water to walls may be interrupted for grout cleaning only over the areas being cleaned at the time, and the concrete surface shall not be permitted to become dry during such interruption.

3. Water curing shall continue for 14 days for concrete containing slag cement, and for 7 days for other types of concrete. However, when concrete is being protected from low temperatures, the duration of water curing may be shortened to 1 day less than the duration of cold weather protection.

4. When forms are removed before the specified curing duration is completed, measures shall be taken to immediately continue water curing and to provide adequate thermal protection for the concrete.

C. Membrane Curing

1. Unless otherwise specified, membrane curing compound may be used instead of water curing on concrete in non-liquid-containing structures which will not be stained or etched, covered with chemical resistant linings, covered with additional concrete, or indicated in the Architectural drawings to be covered with a finish flooring material.

2. Membrane curing compound shall be evenly sprayed at a coverage rate of not more than 300 square feet per gallon . The spray equipment shall have sufficient capacity to continuously spray curing compound at approximately 40 psi with a suitable nozzle as recommended by the manufacturer. Unformed surfaces shall be covered with the first coat of curing compound within 30 minutes after final finishing. A second coat of curing compound shall be applied when the first coat has become tacky to the touch and shall be applied at right angles to the first coat.

3. Curing compound shall be suitably protected against abrasion during the curing period.

D. Film Curing

1. Unless otherwise specified, film curing with white polyethylene sheeting may be used instead of water curing on concrete in nonliquid-containing structures which will be covered later with mortar or additional concrete, or which will otherwise not be exposed to view.

2. Film curing shall begin as soon as possible after initial set of the concrete. The concrete surfaces shall be completely covered with polyethylene sheeting. Sheeting shall overlap the edges of the concrete for proper sealing and anchorage, and joints between sheets shall be sealed. All tears, holes, and other damage shall be promptly repaired. Covering shall be anchored continuously at edges and as necessary to prevent billowing on the surface.

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 and Masonry section. Grouting of masonry is covered in the Masonry section.

1.2 SUBMITTALS

A. Drawings and Data

1. Complete manufacturers' data and product information shall be submitted in accordance with the Submittal Procedures section.

B. Certification Letter

1. A letter of certification indicating the types 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 9000 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."
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 shall be a three component system consisting of a Part A (resin), Part B (hardener) and Part C (aggregate). All three components shall be products of the same manufacturer and be compatible. 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

SECTION 03920 - CONCRETE SURFACE REPAIR

PART 1 - GENERAL

1.1 SCOPE

A. This section covers the repair of existing concrete surfaces as indicated on the drawings, as specified, or as required to complete the Work. This specification covers the furnishing of all labor, equipment and materials required to repair, rehabilitate or reconstruct spalled, deteriorated, or structurally damaged concrete surfaces. Depth of repairs shall be adequate to restore concrete members to original dimensions and surface profiles.

1.2 SUBMITTALS

A. All submittals shall be made in accordance with the Submittal Procedures section.

B. The following items shall be submitted, as a minimum.

Manufacturer's information for all products supplied under this section, in the form of technical data sheets, certificates of compliance, test data, or reports.

Experience record of the applicator.

A letter from each product manufacturer indicating their approval of the following.

Selection of repair material.

Qualifications of the individuals performing the work.

Surface preparation procedures.

Application procedures.

Curing procedures.

1.3 QUALITY ASSURANCE

A. Manufacturer's Field Services

1. The material manufacturer shall provide engineering field services to review the project and the selected material application prior to any preparation; to approve the applicator, the material used, and the procedure to be used; to observe and approve surface preparation; and to observe application and curing procedures. The field representative of the material manufacturer shall submit, in writing through Contractor, approvals of proposed materials, surface preparation, applicator, and application procedures. The field representative shall instruct the applicator, as needed, to assure that handling, mixing,

placing, finishing, and curing of materials are in accordance with specifications and manufacturer's requirements. The field representative shall be an employee of the material manufacturer.

B. Applicator

1. The repair contractor shall have experience and proficiency specific to the repair type and shall be acceptable to Engineer and the material supplier. The applicator shall submit, through Contractor, a satisfactory experience record including references for previous application of the specified materials to concrete structures of similar design and complexity.

C. Pre-construction Meeting

1. At least 30 days prior to planned performance of the Work, Contractor shall conduct a meeting to review the detailed requirements for the Work. Site conditions, surface preparation, proposed equipment, procedures, material mixing, placing and finishing procedures, and curing methods shall be discussed and approved by Engineer and by the manufacturer's field representative. Contractor shall require the attendance of all involved parties, including but not limited to Contractor's superintendent, repair contractor if applicable, manufacturer's field representative and proposed equipment supplier representative. Minutes of the meeting shall be recorded, typed and printed by Contractor and distributed to all parties, including Engineer, within 5 days after the meeting.

D. Site Conditions

1. Job conditions shall be maintained at standards that allow material placement within temperature and cleanliness requirements. Unusual conditions or unexpected additional deterioration uncovered during the course of Work by Contractor shall be brought to Engineer's attention for analysis and disposition. These conditions include but are not limited to poor quality base concrete, severely corroded reinforcing steel, random cracks, deep oil penetration and any other condition which would prevent completion of the Work in accordance with manufacturer's recommendations and this specification.

1.4 PRE-BID INSPECTION

A. Contractor shall visit the site prior to bid submittal to witness and verify the extent of the required repairs. Final bid shall include a lump sum for the Work with a unit price adjustment for each repair type. Unit prices shall be utilized to adjust the final project cost upon completion and acceptance of the Work based on actual quantities more than or less than the bid form estimated quantities.

PART 2 - PRODUCTS

2.1 ACCEPTABLE PRODUCTS

A. Concrete repair products shall be manufactured by the Euclid Chemical Company, Master Builders Solutions, Sika Corporation, or equal as specified herein. Equivalent products of other manufacturers regularly producing high quality concrete repair materials, providing engineering field services, and meeting the specified quality assurance requirements may be furnished subject to acceptance by Engineer.

2.2 MATERIALS

A. Unless otherwise specified or authorized, materials shall conform to the requirements specified herein. Types of materials or concrete repair not specified herein shall be as specified in other sections, as indicated on the drawings or, in the absence of any definite requirement, as recommended by the manufacturer's field representative and acceptable to Engineer.

B. Products shall not exceed VOC limits established by the federal, state, or local regulatory agency having jurisdiction over the project site.

C. Floor Surface Repairs, Thickness of 1/4 inch or Less

1. One or two component, polymer modified, cementitious material.

a. Compressive strength
   1) 6,000 psi at 28 days using 2 inch cubes, per ASTM C109.

b. Products
   1) Master Builders Solutions "MasterEmaco N 300 CI"
   2) Euclid "Thin-Top Supreme"
   3) Sika "SikaTop 121 Plus

c. Bonding agent
   1) Repair mortar scrub coat per manufacturer's instructions

D. Floor Surface Repairs, Thickness between 1/4 inch and 1 Inch

1. One or two component, polymer modified, cementitious material containing a corrosion inhibitor.

a. Compressive strength
   1) 7,000 psi at 28 days using 2 inch cubes, per ASTM C109.

b. Flexural Strength
   1) 1100 psi at 28 days, per ASTM C348

c. Bond Strength
   1) 2000 psi at 28 days, per ASTM C883

d. Products
   1) Master Builders Solutions “MasterEmaco T 310 CI”
   2) Euclid “VersaSpeed LS100”
   3) Sika “SikaTop 122 Plus

e. Bonding agent
   1) Repair mortar scrub coat per manufacturer’s instructions

E. Floor Surface Repairs, Thickness Greater Than 1 Inch

1. One component, polymer modified, cementitious material containing a corrosion inhibitor.

   a. Compressive strength
      1) 7,000 psi at 28 days using 2 inch cubes, per ASTM C109.

   b. Flexural Strength
      1) 1100 psi at 28 days, per ASTM C348

   c. Bond Strength
      1) 2000 psi at 28 days, per ASTM C882

   d. Products
      1) Master Builders Solutions “MasterEmaco T 310 CI”
      2) Euclid “VersaSpeed LS100”
      3) Sika “SikaTop 122 Plus”

   e. Bonding agent
      1) Repair mortar scrub coat per manufacturer’s instructions

F. Vertical and Overhead Surface Repairs, Trowel Applied

1. One or two-component, polymer modified, cementitious mortar containing a corrosion inhibitor.

   a. Compressive strength
      1) 5,500 psi at 28 days using 2 inch cubes, per ASTM C109.

   b. Flexural Strength
      1) 600 psi at 28 days, per ASTM C348

   c. Bond Strength
      1) 1800 psi at 28 days, per ASTM C882

   d. Products
      1) Master Builders Soltuions “MasterEmaco N 400”
      2) Euclid “Eucorepair V100” or “Tamms Structural Mortar”
      3) Sika “SikaTop 123 Plus

   e. Bonding agent
      1) Repair mortar scrub coat per manufacturer’s instructions

G. Vertical Repairs, Form and Pour, Thickness 6 Inches or Less

1. One-component, cementitious material containing a corrosion inhibitor. Shrikage compensated or polymer modified.

a. Compressive strength
1) 6,500 psi at 28 days using 2 inch cubes, per ASTM C109.

b. Flexural Strength
1) 770 psi at 28 days, per ASTM C348

c. Bond Strength
1) 2500 psi at 28 days, per ASTM C882

d. Rapid Chloride Permeability
1) Maximum 650 coulombs at 28 days, per ASTM C1202

e. Products
1) Master Builders Solutions “MasterEmaco S 466Cl”
2) Euclid “Eucorepair SCC Fast”
3) Sika “Sikacrete 211 SCC Plus”

f. Bonding agent
1) Extended open time type; three component, epoxy modified, with corrosion inhibitor, minimum bond strength of 2000 psi at 7 days per ASTM C882.
a) Master Builders Solutions “MasterEmaco P 124”
b) Euclid “Duralprep A.C.”
c) Sika “Armatec 110 EpoCem”

H. Vertical Repairs, Thickness Greater Than 6 Inches

1. Cast-in-place concrete, per the Cast-in-Place Concrete specification 03300.

a. Bonding agent
1) Extended open time type; three component, epoxy modified, with corrosion inhibitor, minimum bond strength of 2000 psi at 7 days per ASTM C882.
a) Master Builders Solutions “MasterEmaco P 124”
b) Euclid “Duralprep A.C.”
c) Sika “Armatec 110 EpoCem”

b. Water
1) Clean and free from deleterious substances.

I. Reinforcement Anti-Corrosion Coating

1. Extended open time type; three component, epoxy modified, with corrosion inhibitor, minimum bond strength of 2000 psi at 7 days per ASTM C882.

a. Master Builders Solutions “MasterEmaco P 124”
b. Euclid “Duralprep A.C.”

c. Sika “Armatec 110 EpoCem”

J. Penetrating Sealer

1. Silane-based sealer with minimum 40% active ingredient. Minimum water repellency of 85% by ASTM C642.

a. Master Builders Solutions “MasterProtect H 400”
b. Euclid “Baracada Silane 40 WB”
c. Sika “Sikagard 740 W”

K. Coarse Aggregate Extension of Cementitious Mortar

1. In areas where depth of repair exceeds manufacturer’s recommended limits for neat repair mortar, repair mortar may be extended with washed, graded, rounded, high-density, low-absorption coarse aggregate meeting ASTM C33. Aggregate shall be in size and volumes recommended by the product manufacturer. Aggregate extension shall not be permitted unless approved by Engineer.

PART 3 - EXECUTION

3.1 GENERAL

A. Unless otherwise specified, all materials shall be prepared and applied in strict accordance with the manufacturer’s printed installation instructions.

3.2 INSPECTION

A. Prior to the placement of repair material, the surface to be repaired shall be inspected by the material manufacturer’s field representative to assure the surface conditions are correct for the type of repair and the material is being used as specified.

3.3 PREPARATION

A. Cleaning

1. The surface of existing concrete shall be clean and the pores free of any dirt or material that will be detrimental to the bond of the repair material. All oil, dirt, debris, paint, and unsound concrete shall be removed. Cleaning shall include complete removal of all dust, dirt, and residue by high pressure washing.

B. Surface Preparation

1. All prepared surfaces shall conform to the requirements of the material manufacturer. All edges shall be square cut to avoid feather edges. As required, surfaces shall be prepared mechanically using a scabbler, bushhammer, chipping hammer, shotblast, scarifier or hydrodemolition equipment which will give the specified surface profile. Means and

methods selected, subject to acceptance by Engineer, shall minimize surface micro-cracking (i.e. "bruising") and impact on areas surrounding the Work area. Contractor shall provide a minimum Concrete Surface Profile (CSP) equal to that recommended by the material manufacturer.

2. Remove all loose and unsound concrete per International Concrete Repair Institute (ICRI) Guideline 310.1R "Guide for Surface Preparation." Repair areas shall be sawcut around the perimeter in a square or rectangular shape. For thin repairs of 1/4 inch or less, the saw cut depth shall not exceed 1/4 inch deep. For thicker repairs, the saw cut depth shall be a minimum of one-half inch but shall be limited to prevent the saw from damaging embedded reinforcement. Saw cuts shall be made perpendicular to the concrete surface and all concrete removal boundaries shall be straight.

3. Concrete shall be removed within repair boundaries to depth that is as uniform as practicable, and within the minimum and maximum layer thicknesses recommended by the material manufacturer. Exposed concrete surfaces shall be visually examined and tested with a mason's hammer to confirm soundness of the base material. If delamination, cracking, or otherwise unsound material exists, Contractor shall notify Engineer for direction before continuing with the work.

C. Cracks

1. Cracks shall be located and repaired, if required, in accordance with the Concrete Crack Repair specification. All cracks located within or adjacent to Work covered under this specification shall be repaired prior to performance of the Work covered under this specification.

D. Inspection and Replacement of Reinforcement

1. If reinforcement is exposed so that more than half the circumference of the bar is visible, the remaining concrete shall be removed to provide 1 inch of clear space all around the bar.

2. Reinforcement that has lost more than 20 percent of its original cross-sectional area shall be repaired by adding new reinforcement. The new reinforcement shall be spliced or connected to the existing reinforcement on both ends of the damaged portion of the original bar. Splices shall be Class B, and mechanical connectors shall be ACI 318 Type 2.

3. Contractor shall clean all exposed reinforcing steel to a bare metal finish prior to installation of repair materials.

4. Repaired reinforcement shall be inspected by Engineer or City's representative prior to placement of concrete repair materials.

3.4 APPLICATION

A. Concrete repair work shall be performed in accordance with the following requirements.

B. Bonding and Priming

1. Bonding agent shall be applied per manufacturer's recommendations. The manufacturer's coverage rate shall be followed. For rough surfaces, scrub bonding agent into the surface with a stiff broom.

2. Apply all prepackaged bonding agent materials within recommended ambient and substrate temperatures published in the manufacturer's printed installation instructions. Materials shall not be applied over frozen or liquid filled surfaces.

3. Upon completion of all concrete and reinforcing steel demolition, surface preparation, and cleaning operations, apply specified bonding agent to substrate. Provide complete and thorough coverage of surface assuring that bonding agent has been fully worked into profile of surface.

4. For repair mortar scrub coat bonding agents, the concrete surface shall be saturated with water one hour prior to placement of the scrub coat to provide a saturated substrate. Just prior to application of the scrub coat, water shall be removed by compressed air blasting. Compressed air shall be maintained free of oil and contaminants by filtration as needed. The mortar scrub coat shall be wet and not yet stiffened when repair material is applied.

5. For extended open time bonding agents, mix bonding agent and apply two uniform coats at manufacturer's published recommended coverage rates to properly prepared surfaces. Allow adequate time between coats per manufacturer's recommendations. The repair material shall be applied within the allowable open time of the bonding agent.

C. Treatment of Reinforcement and Other Metal Embedments

1. All existing and new reinforcement shall be secured and properly positioned by tying to other secured bars or supplemental anchoring pins as needed.

2. All exposed reinforcement and other metal embedments within the repair area shall be treated with two coats of anti-corrosion coating.

D. Forming

1. Forms shall be water-tight and constructed with sufficient rigidity to withstand head pressure and prevent excessive deflection during material placement. For pumped applications without open top forms, provide a port connection or birdmouth of sufficient size to allow pumping into the form. After forms are removed, all birdmouths and other protrusions resulting from the placement method shall be carefully removed and the surface smoothed.

2. Tolerances for formed work shall be as stipulated in ACI 117 for cast-in-place concrete, unless otherwise indicated. Formed surfaces shall meet Class C requirements for both abrupt and gradual irregularities.

E. Shoring and Support

1. When removal and repair of deteriorated concrete may cause temporary weakness, excessive deflections, structural instability, or other unacceptable damage, shoring or other suitable supports shall be provided until completion of the repair work is complete and the material has reached its design compressive strength.

F. Cold Weather Conditions

1. Repair materials shall not be applied without protection in temperatures below 45 degrees F, nor when the temperature is expected to fall below 45 degrees F during the curing period, unless more stringent requirements are provided by the material manfacturer's printed installation instructions.

3.5 FINISHING

1. All surfaces shall be finished to match the surrounding concrete.

3.6 CURING

A. General

1. Immediately following placement and finishing procedures, cure cementitious repair mortars for a minimum of seven days**]**. Curing procedures shall be in accordance with ACI 308.1 and the manufacturer's printed installation instructions. The more stringent requirements shall control.

2. When ambient temperatures below 45 degrees F are expected during the curing period, the repair material shall be maintained at 50 degrees F for the full period. Sudden cooling shall not be permitted. Gradual temperature drop shall be maintained at not more than 20 degrees F in any 24 hour period. Carbon dioxide or exhaust gases from combustion heaters shall not be allowed within enclosures or allowed to contact the repair material. Repair materials shall not be exposed to freezing temperatures until at least 24 hours after the end of the curing period..

3. Unless specified otherwise, one or more of the following methods shall be used:

B. Water Curing

1. Keep concrete surfaces continuously wet with water during the curing period. The method used shall limit water runoff and any runoff shall be directed and controlled. The difference in temperature between the water used for curing and the concrete surface shall not exceed 20 degrees.

C. Wet Coverings Curing

1. Cover the surfaces with moisture retaining curing blankets, burlap, cotton mats, or other suitable moisture retaining materials. The coverings shall not stain or otherwise discolor the repair material or the surrounding surfaces, and shall keep the repair products fully saturated during the curing period. Lap all coverings at least 8 inches at joints.

D. Membrane Curing

1. Membrane curing compounds shall only be used if the repair material manufacturer's printed installation instructions recommend a compound be used instead of water or wet coverings. Membrane curing compounds shall not be used on surfaces to receive a penetrating sealer.

3.7 SEALING

A. Provide a penetrating sealer over the concrete repair product when recommended by the repair product manufacturer, or when no other sealer is specified on the drawings or other specifications. The penetrating sealer shall be applied in accordance with the manufacturer's instructions.

3.8 FIELD QUALITY CONTROL

A. Material Storage and Handling

1. The material shall be delivered in original, unopened containers. Containers shall be labeled with the manufacturer's name, product name, and lot number. Materials shall be stored at the job site under dry conditions and at temperatures between 50 degrees F and 90 degrees F unless more stringent limitations are required by the manufacturer.

B. Protection

1. Repair areas shall be protected from other trades and weather for a minimum of 10 days after material is placed.

C. Cleaning

1. Work areas are to be cleaned each day in accordance with the Project Requirements section. Upon completion of the final cleanup, Contractor shall restore all areas affected by repair procedures to their original condition, leaving no trace of material piles or other wasted materials.

End of Section

SECTION 03930 - CONCRETE CRACK REPAIR

PART 1 - GENERAL

1.1 SCOPE

A. This section covers the repair of concrete and shotcrete cracks and joints.

B. Both inch-pound (English) and SI (metric) units of measurement are specified herein; the values expressed in inch-pound units shall govern.

C. General Crack Repair

1. General crack repair is applicable only to new construction, and shall include the following:

   a. Sealing of all cracks and crack networks that are wider than 10 mils (0.01 inch) as measured at the exposed surface.
   b. All necessary repairs to structures that have failed a tightness test, including sealing of construction joints.

2. All costs for general crack repair shall be included in the Contract Price. General crack repair work is expected to be necessary due to cracks that commonly develop during concrete construction.

D. Engineer-Directed Crack Repair

1. Engineer-directed crack repair is applicable only to new construction, and shall only be performed when instructed by Engineer. The work shall include, but is not limited to, the following:

   a. Sealing of construction joints that are not otherwise required to be sealed as the result of a failure of a leakage test.
   b. Sealing of cracks and crack networks with a width of 10 mils (0.01 inch) or less as measured at the exposed surface.

2. Contractor shall include 150 linear feet of Engineer-directed crack repair in the Contract Price. The Engineer-directed crack repair may be either epoxy resin or foam resin, as determined by Engineer.

E. Pre-Defined Crack Repair

1. Pre-defined crack repair is applicable only to existing structures, and the extent of this type of repair is indicated on the Drawings.

2. Prior to beginning the repair work Contractor shall field verify and provide clear bright colored marking to the cracks to be repaired. Crack repair work shall not begin until marking is complete and has been approved by Engineer.

1.2 SUBMITTALS

A. Specifications and data covering physical properties, mixtures, application procedures, and curing procedures of the materials proposed shall be submitted in accordance with the Submittals Procedures section. Submittals shall include the approvals from the material manufacturer.

1.3 QUALITY ASSURANCE

A. Manufacturer's Field Services

1. The material manufacturer shall provide engineering field services to review the Work and the material application prior to any preparation; to approve the applicator, the material used, and the procedure to be used; to observe surface preparation; to approve surface preparation; and to observe application. The field representative of the material manufacturer shall submit, in writing through Contractor, approvals of proposed material, application procedures, applicator, and surface preparation. The field representative shall be an employee of the material manufacturer.

B. Applicator

1. The applicator shall submit through Contractor a satisfactory experience record including references from previous application of the specified materials to structures of similar design and complexity.

C. Pre-Construction Meeting

1. At least 30 days prior to concrete crack repairs, Contractor shall conduct a meeting to review the detailed requirements for rehabilitation work. Site conditions, surface preparation, proposed equipment, procedures, material mixing, placing procedures, and curing methods shall be discussed and approved by Engineer and by the manufacturer’s field representative. Contractor shall require the attendance of all involved parties, including but not limited to Contractor’s superintendent, repair contractor, manufacturer’s field representative and proposed equipment supplier representative. Minutes of the meeting shall be recorded, typed and printed by Contractor and distributed to all parties within 5 days after the meeting.

D. Quality Assurance Certification

1. Material manufacturers shall be ISO 9001/9002 registered or shall provide proof of documented quality assurance. The documented quality assurance system shall be obtained through an independent auditing registrar.

1.4 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.

PART 2 - PRODUCTS

2.1 PERFORMANCE AND DESIGN REQUIREMENTS

A. Unless otherwise specified or authorized, repairs shall conform to the requirements specified herein. Types of repairs not specified herein shall be as specified in other sections, as indicated on the Drawings, or, in the absence of any definite requirement, as recommended by the manufacturer's representative and subject to acceptance by Engineer. The following types of repairs shall be performed as required.

B. Epoxy Resin

1. Unless indicated otherwise on the drawings, epoxy resin shall be used to seal construction joints and cracks. Epoxy resin shall be pressure-injected for vertical and overhead applications. Epoxy resin may be applied by gravity feed in lieu of pressure injections for cracks in floors, using a very low-viscosity material.

C. Foam Resin

1. Foam resin shall be used to seal expansion joints. Otherwise, foam resin shall only be used to seal crack and joints when indicated on the drawings or when permitted by Engineer in lieu of epoxy resin. Foam resin shall be pressure-injected.

2.2 ACCEPTABLE PRODUCTS

A. Repair products/materials shall be as specified herein. Equivalent products of other manufacturers regularly producing high quality concrete crack repair products/materials, providing engineering field services, and meeting the specified quality assurance requirements may be furnished subject to review and acceptance by Engineer.

2.3 MATERIALS

A. Materials shall be approved by the manufacturer for the type of application, including temperature and moisture conditions encountered. Products used in structures containing potable water shall be certified for NSF/ANSI 61.

Epoxy Resin	ASTM C881, Type I or Type IV, moisture tolerant or moisture insensitive.
Crack Sealant	As recommended by the manufacturer of the epoxy resin product.
Foam Resin	Hydrophilic polyurethane foam; Prime Resins “Prime-Flex 900 XLV”, DeNeef "Sealfoam PURe", Euclid “Dural Aqua-Fil”, or Avanti “AV 333 Injectaflex”.
Foam Resin Accelerator	As recommended by foam resin manufacturer.

Water	Clean and free from deleterious substances.

PART 3 - EXECUTION

3.1 INSPECTION

A. Prior to the placement of the repair materials, the crack to be repaired shall be inspected by the material manufacturer to assure that preparation and conditions are correct for the type of repair and the product/material being used as specified herein.

3.2 PREPARATION

A. All cracks and surfaces around the cracks shall be free of objectionable substances and shall conform to the requirements of the material manufacturer. Concrete and shotcrete to be repaired shall be cleaned by methods acceptable to the material manufacturer so that the cracks are free of dirt, oil, grease, laitance, and other foreign matter. All loose and deteriorated existing concrete and shotcrete shall be removed down to sound materials. All concrete and shotcrete surfaces shall be checked for delamination to ensure that all surfaces are sound. All edges shall be square cut to avoid feather edges.

B. Any other preparation recommended by the material manufacturer shall be brought to Engineer's attention and may be incorporated into the work if acceptable to Engineer.

C. Concrete and shotcrete surfaces in the area of a crack to be repaired shall be cleaned by wire brushing, blasting, or other acceptable methods.

D. Wall surfaces shall be sandblasted clean to expose crack networks and construction joints. If there is active water seepage in the repair area, the seepage shall be stopped as recommended by the injection material manufacturer and as acceptable to Engineer. Injection ports shall be installed, when recommended by the injection material manufacturer.

E. Injected Epoxy Resin

1. Preparation for injected epoxy resin shall include sealing the surface at the crack, on both sides when possible, with crack sealant as recommended by the material manufacturer and as acceptable to Engineer for the pressure injection work. Injection ports for epoxy resin shall penetrate through the crack sealant into the cracks at spacings recommended by the material manufacturer.

F. Injected Foam Resin

1. Preparation for injected foam resin shall include drilling offset injection holes at an angle that will intersect the crack, joint, or crack network at approximately one-half the thickness of the concrete or shotcrete up to a thickness of 36 inches . Spacing of injection ports shall be determined as recommended by the injection material manufacturer and as acceptable to Engineer. When the injection material manufacturer certifies, in writing,

that spacing of injection ports and installation procedures are acceptable, the injection ports may be installed directly into the crack, subject to review by Engineer.

3.3 APPLICATION

A. Concrete and shotcrete repair work shall be performed in accordance with the following requirements.

B. Crack Sealant

1. Crack sealant shall be trowel-applied to a minimum dried thickness of 1/8 inch , or thicker if directed by manufacturer’s literature. The concrete surface where the sealant is applied shall be smooth, uniform, and free from irregularities. Crack sealant shall be removed after the injection of resin is completed, except for portions of wall faces that will be at least 12 inches below the finished grade.

C. Pressure-Injected Resin

1. The injected areas shall be prepared as specified and as recommended by the manufacturer.

2. After the joints and cracks are prepared and before the injection of the resin, the joints shall be flushed with water. The water flush shall be terminated when the turbidity of the expelled water is equal to that of the flush water. Unless otherwise acceptable to resin manufacturer and Engineer, cracks shall be dry prior to injecting resin.

3. The pumping equipment used for the pressure injection of resin shall have pressure metering. Written procedures for use and quality control of the injection equipment shall be furnished to Engineer for review and acceptance. The pump shall be electric. The material and process used for the pressure injection of the resin shall have been in use a minimum of 5 years.

4. The joints and crack networks shall have a minimum of 90 percent penetration of resin into the joint or crack network. Core samples may be taken at Engineer's discretion.

5. Epoxy Resin

a. Epoxy resin shall be injected into the structure in accordance with the material manufacturer's recommendations and as acceptable to Engineer. Epoxy resin shall be injected until the resin appears at the next injection port.

6. Foam Resin

a. Foam resin shall be premixed and injected into the structure in accordance with the material manufacturer's recommendations and as acceptable to Engineer. Foam resin shall be injected into the structure until the resin appears at the next injection port.
b. Surfaces of cracks and joints may need to be sealed with crack sealant.

D. Gravity Fed Resin

1. A bead of the epoxy resin shall be placed over the entire surface of the crack. Enough resin shall be applied so that there is a visible heaping above the floor surface.

2. The applicator shall periodically inspect the resin to verify that it has penetrated the crack and flattened against the floor surface.

3. After the resin has flattened, another bean shall be applied, and the process repeated until the crack cannot receive additional resin.

E. Cold Weather

1. When ambient temperatures below 40° F are expected during the curing period, the repair materials shall be maintained at a temperature of at least 50° F for 14 days or 75° F for 7 days after placement. Sudden cooling of the repair materials shall not be permitted.

3.4 PROTECTION

A. Post-placement curing and protection shall be as specified herein and in accordance with the manufacturer's recommendations.

3.5 CLEANING

A. Work areas shall be cleaned each day in accordance with the Project Requirements section. Upon completion of the final cleanup, Contractor shall restore all areas affected by the repair procedures to their original condition, leaving no trace of material piles or other wasted materials.

End of Section

SECTION 05010 – SANITARY SEWER MANHOLE CASTINGS

PART 1 - GENERAL

1.01 SUMMARY

A. This specification covers ductile iron castings and composite castings. All castings for manholes on sewer mains up to 48 inches in diameter shall have a clear opening of 30 inches.

1.02 DESCRIPTION

A. This specification is applicable for ductile iron castings and composite castings. Prior to the Contractor supplying castings, all manufacturers shall be approved suppliers and be able to demonstrate that there is an acceptable quality control program at the producing foundry and/or molding facility.

1.03 SPECIFICATION MODIFICATIONS

A. It is understood that throughout this section these Specifications may be modified by appropriate items in Section 01015 – Specific Project Requirements or as otherwise indicated on the Contract Drawings.

1.04 RELATED SECTIONS

A. Section 01300 – Submittals.
B. Section 01015 – Specific Project Requirements.
C. Section 03370 – Sanitary Sewer Manhole Construction.

1.05 CODES AND STANDARDS

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only. The version of the codes and standards in effect at the time of the Notice to Bidders shall be used, except as noted on the Drawings or in the Specific Project Requirements section of these specifications.
B. American Association of State Highway and Transportation Offices (AASHTO):
   AASHTO M306 (Latest Revision) – Drainage, Sewer, Utility, and Related Castings.
   Standard Specifications for Highway Bridges**.**
C. American Society for Testing and Materials (ASTM) International:

ASTM A536	Standard Specification for Ductile Iron Castings.
ASTM A615	Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
ASTM C478	Standard Specification for Precast Reinforced Concrete Manholes Sections.
ASTM D2240	Standard Test Method for Rubber Property – Durometer Hardness.
ASTM C501	Standard Testing for Wear and Abrasion.
ASTM G154	Standard Practice for Operating Fluorescent Ultraviolet (UV) Lamp Apparatus for Exposure of Nonmetallic Materials.
ASTM C1028	Standard Testing for Coefficient of Friction.

D. U.S. Environmental Protection Agency: Material Safety and Data Sheet.
E. Federal Register: 29 CFR 1910.1200 Hazard Communications.

F. Federal Standards:
FED-STD-123 Marking for Domestic Shipment (Civilian Agencies).
G. United States Customs Service:
Custom Regulation Chapter 1, Part 134, Article 19, U.S.C. 1304.

1.06 CONTACTOR SUBMITTALS

A. Submit the following in accordance with Section 01300:
1. Certified shop drawings for all castings, product data, manufacturer's catalog cut sheets, specifications, and installation details.
2. Casting identification and location:
(a) Iron Casting submittals shall include a certification of conformance in accordance with AASHTO M306 (Part 9, Certification).
(b) Composite Frames and Cover submittals shall include a certification of conformance to proof-load testing section of AASTHO M306.
(c) A foundry certification shall be furnished stating that samples representing each lot have been tested, inspected and are in accordance with this specification.
3. A manufacturer’s affidavit certifying that the castings furnished comply with the provisions of these specifications, regardless of whether or not the purchaser has an inspector at the plant.
4. All submittals shall be approved by the City before castings are ordered by the Contractor.

1.07 QUALITY ASSURANCE

A. The Contractor is responsible for the quality assurance and quality control of the work.
B. The Manufacturer shall guarantee items to be free of defects.
C. Manufacturer shall have a quality control process in place and shall provide a copy of their “Quality Control Manual.”
D. The manufacturer shall keep records of all tests, MSDS sheets, foundry, lot records, product liability insurance and any customs documentation control data for a period of 3 years. The supplier agrees to furnish copies of records within two weeks after the receipt of request for such records.

1.08 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Check materials upon arrival. Identify and segregate as to types, functions, and sizes. Store materials off of the ground in a manner affording easy accessibility and not causing excessive rusting or coating with grease or other objectionable materials.
B. Unless otherwise specified on the purchase order, cleaning, preservation, and packaging of castings shall be in accordance with the manufacturer's commercial practice. Packing and marking shall also be adequate to ensure acceptance and safe delivery by the carrier for the mode of transportation employed.
C. If the number of defective items exceeds two and one-half percent of the lot, the purchaser will reject the remaining quantity in the lot and the supplier will redeliver the remaining quantity of the lot.
D. All castings shall be marked in accordance with the requirements of Federal Standard No. 123 and with Chapter 1, Part 134 of the United States Customs Service Regulations, including 19 U.S.C. 1304 paragraph, as applicable. Failure to conform to the above requirements will be just cause for rejection of castings.

PART 2 - PRODUCTS

2.01 DUCTILE IRON CASTINGS

A. Castings shall be manufactured and tested in accordance with ASTM A536 and AASHTO M306-10.

2.02 COMPOSITE FRAMES AND COVERS

A. Castings shall conform to the following standards:
   1. Composite frames and covers shall be manufactured from fiber reinforced polymer (FRP) and the color shall be black. Fiber reinforcement shall consist of fiberglass, carbon, aramid, basalt, and/or natural fibers. The polymer matrix shall be thermoset consisting of a polyester, vinyl ester, epoxy, polyurethane, and/or hybrid chemical composition.
   2. Cover shall have a gasket seal, and two locking lugs made of stainless steel. The locking lugs shall be designed to lock under the seat of the frame. Lock lugs shall be actuated by a stainless-steel 3/8 Allen Head bolt. All metal hardware shall be 316 Stainless Steel.
   3. Proof Load Testing: Traffic service frames and covers shall have a first article proof load test conducted and the results of that proof load shall be made available to the purchaser upon request. The proof load shall be conducted in accordance with the method and procedure that is outlined in AASHTO M306. The product shall be tested on a suitable and calibrated load testing machine, the composite frame and cover shall hold a 50,000-pound proof load for one minute without experiencing any cracks or detrimental permanent deformation. During the load testing process visible cracking, visible cracks or delamination will be cause for rejection. When load is removed, Permanent Set (Deflection) of more than 1/8” (.125”) measured at center of load area will be cause for rejection. All testing shall be conducted on a NIST calibrated and certified load test machine.
   4. Ultraviolet resistance: Cover shall meet ultraviolet requirements as defined in ASTM G154 (Cycle 1 for 1600 hours). Specimens shall be tested for ultimate flexural strength, retaining at least 75% of control values for load and deflection at failure.
   5. Coefficient of Friction: Static Coefficient of Friction of cover shall be 0.5 or greater, as described in ASTM C1028 Standard, in both wet and dry applications.
   6. Wear and Abrasion: Shall be tested in accordance with ASTM C501, Test shall be 1000 cycles of a H22 wheel with 1000g load. Wear Index is calculated 88/Weight Loss (grams). The four test cycle average shall have a calculated wear index of >300

2.03 WORKMANSHIP AND FINISH

A. Castings shall be of uniform quality, free from all defects, holes, shrinkage, cracks and any other surface defect. Ductile iron castings shall be ground smooth and cleaned by shot blasting. Runners, risers, fins, and other cast-on pieces shall be removed.
B. As-cast dimensions may vary by one half the maximum shrinkage possessed by the metal or ± 1/16 in/ft.
C. As-cast weight may vary by ±5 percent from the drawing/specification weight.
D. For traffic service castings, bearing surfaces between manhole rings and covers or grates and frames shall be cast or machined with such precision to prevent rocking.

E. Circular manhole frames and covers shall be furnished with machined horizontal bearing surfaces unless otherwise specified in the standard details.
F. In other matters of workmanship and finish, the castings shall conform to any points agreed upon by the City and the manufacturer/supplier.

2.04 MANHOLE FRAMES AND COVERS

A. Frames and covers shall be as indicated and shall be of the type suitable for the application. The frames and covers shall be circular and the covers without vent holes. Covers located in the combined sewer system may have vent holes, see Section 01015 – Specific Project Requirements.
B. Markings – See Figure 1, Figure 2, and Figure 3 for approved markings at the end of this section.
C. The minimum clear opening shall be 30 inches for all 5.0-foot diameter manholes and 6.0-foot diameter manholes.
D. All covers shall have provisions for ease of opening, such as concealed pick holes.
E. Special Requirements for Paved Areas (ductile iron or composite acceptable):
    1. Definition: Areas subject to vehicular traffic. Includes, but is not limited to, all paved areas.
    2. All frames and covers shall be "Traffic Rated" in accordance with AASHTO M306 (HS-25) Loading.
    3. All DI manhole frames and covers shall be hinged, adjustable and self- leveling. Frames and covers shall be adjustable to meet any slope and grade of the roadway (from 0 to 17%) and shall be able to be raised or lowered in ¼ inch increments, up to 2¼ inches. Ring height shall be adjustable after installation without disturbing the surrounding pavement or composite frames and covers using grade rings to meet grade
    4. Acceptable manufactures include the following (or approved equal):
        (a) Hinged ErgoXL Self-Level Manhole Frame and Cover with Gasket Cover as manufactured by East Jordan.
        (b) PAMREX VIATOP (reference #CDVT6OQG) as manufactured by CertainTeed.
        (c) Composite Access Products (CAP)
F. Special Requirements for Green Spaces (composite only required):
    1. Definition: Areas that are not subject to regular vehicular traffic. Includes, but is not limited to, greenways, easements, sidewalks, and driveways.
    2. All frames and covers shall be rated for AASHTO M306 (HS-25) Loading.
    3. Flange shall incorporate bedding slots or bolt holes.
    4. Acceptable manufacturers include the following (or pre-approved equal):
        (a) CAP as manufactured by Composite Access Products.
        (b) Durostreet as manufactured by East Jordan.
G. Special Requirements for Flood Plains:
    1. Definition: Areas that are designated Flood Plains.
    2. All frames and covers shall be watertight.
    3. All frames and covers shall be rated for AASHTO M306 (HS-25) Loading.
    4. Flange shall incorporate bedding slots or bolt holes.
    5. Stainless Steel bolts and nuts for lid shall be supplied with anti-seize coating.
    6. Acceptable manufacturers include the following (or pre-approved equal):
        (a) CAP Bolt down as manufactured by Composite Access Products.

2.05 FRAME AND CHIMNEY SEALING SYSTEM

A. Per Section 03370 – Sanitary Sewer Manhole Construction.

PART 3 - EXECUTION

3.01 MANHOLE FRAMES AND COVERS

A. The Contractor shall coordinate the installation of the castings with the work of the other trades in order to avoid delays. Install inserts or anchors as required by individual items.
B. Install items as specified and in accordance with the manufacturer's instructions.
C. Install items plumb, level, in alignment and anchor securely. All manhole frames with hinged lids shall be anchored at four points.

3.02 CLEANING

A. Clean all items after installation to remove rust, dirt, oil, grease, and other deleterious substances.
B. Clean all welds, bolted connections and abraded areas and apply the shop coating. Touch up damaged areas with the shop coating.

3.03 WARRANTY

A. All castings shall have a lifetime warranty against manufacture defects for all components.

Figure 1, Figure 2, and Figure 3 on pages 6, 7 and 8, respectively.

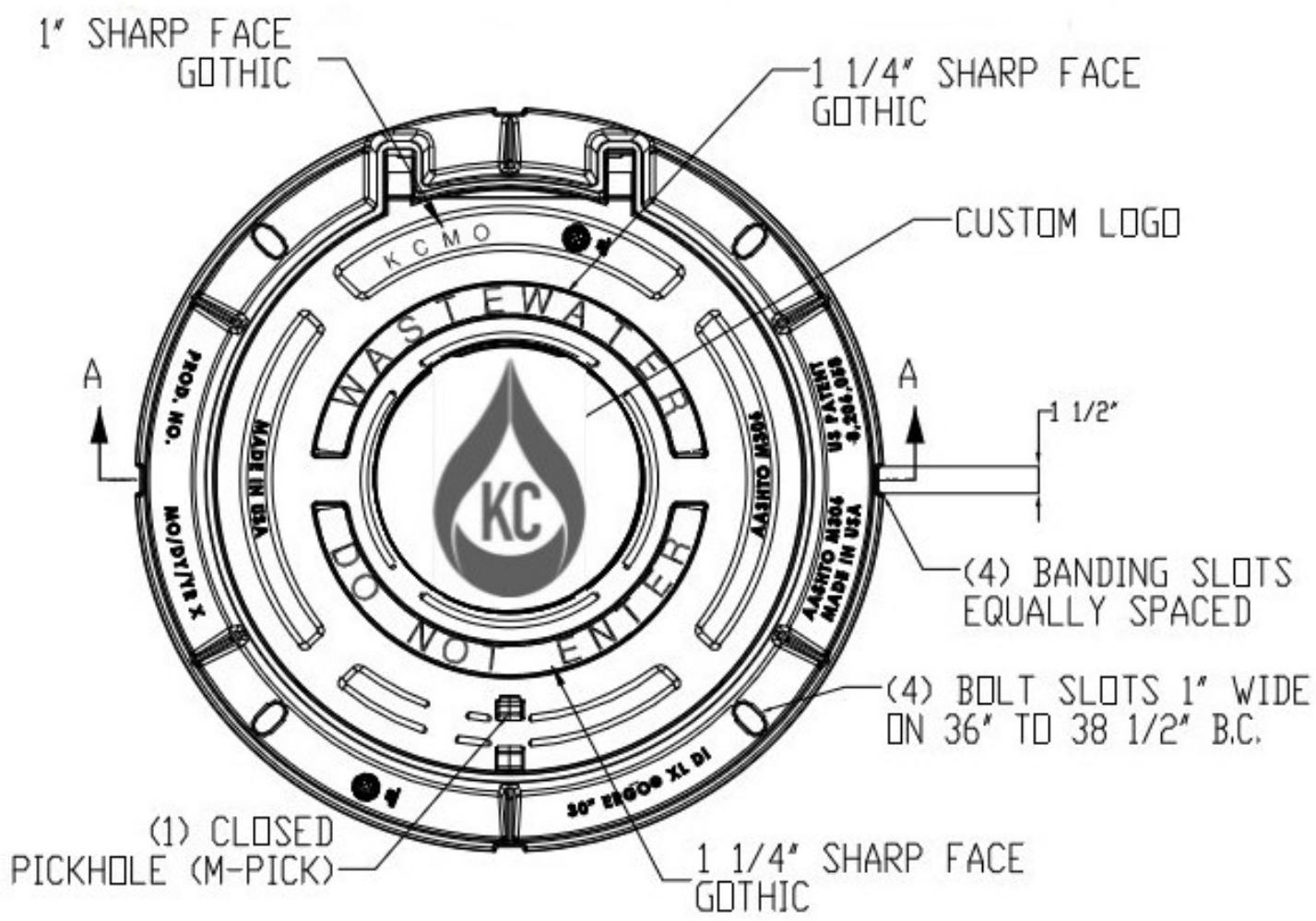


Figure 1: Standard Sanitary Sewer Manhole Markings
For Ductile Iron Castings

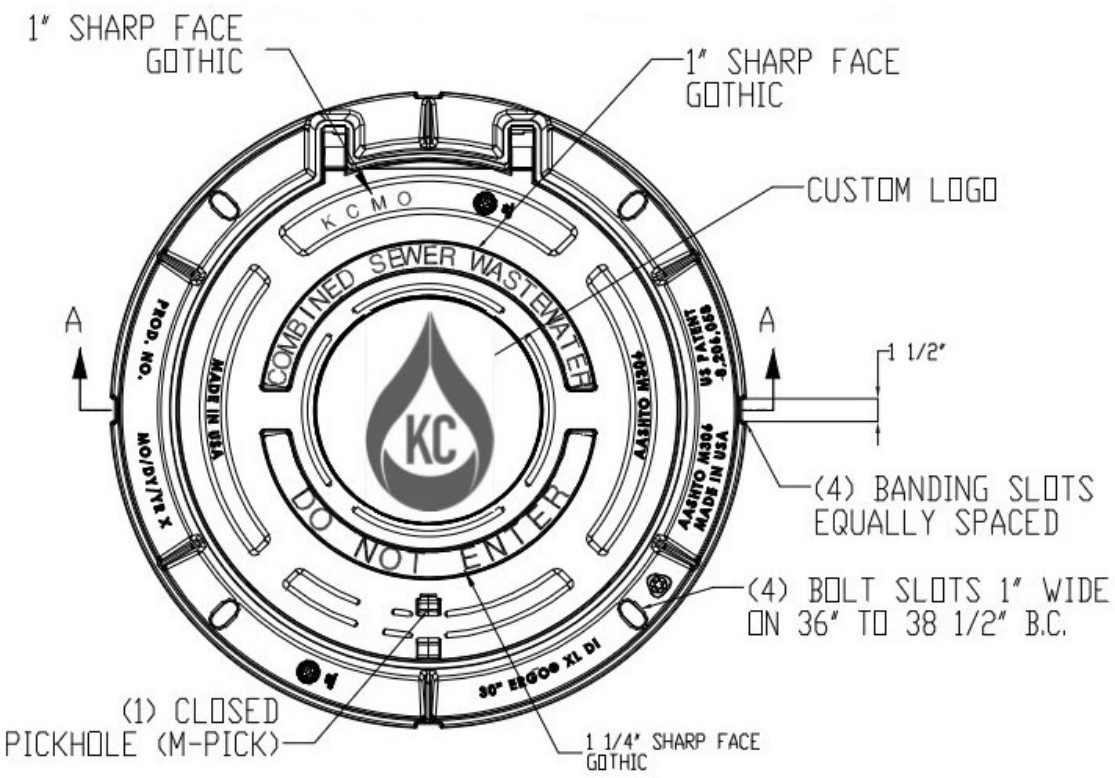


Figure 2: Optional Sanitary Sewer Manhole Markings
For Ductile Iron Castings
See Section 01015 – Specific Project Requirements

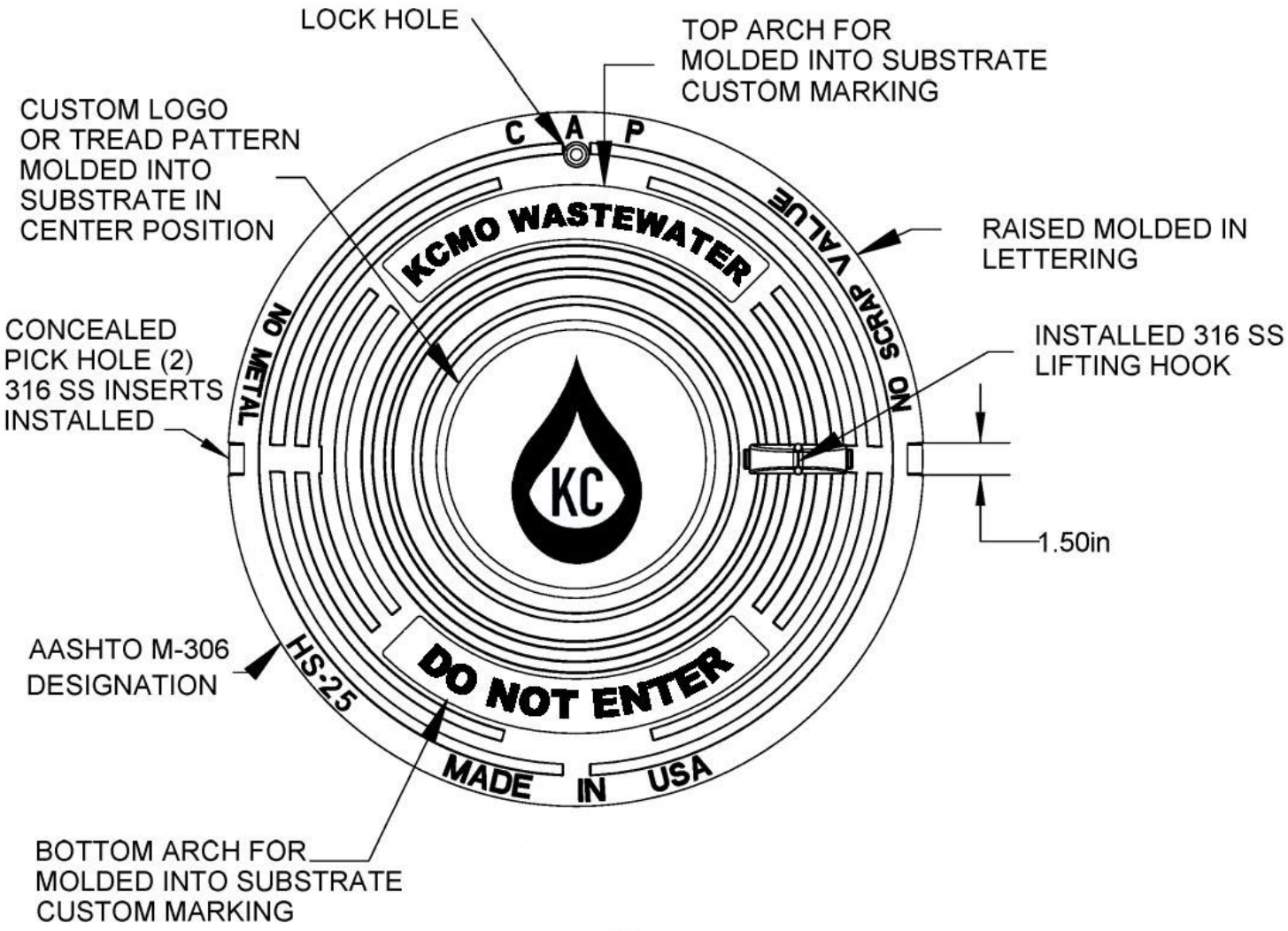


Figure 3: Standard Sanitary Sewer Manhole Markings
For Composite Castings

END OF SECTION

SECTION 05520 - METAL RAILINGS

PART 1 - GENERAL

1.1 SCOPE.

A. This section covers the design, fabrication, and installation of handrailing and guardrailing fabricated from metal. FRP railing systems, concrete and masonry anchorage, structural metals, and miscellaneous metal fabrications are covered in other sections.

1.2 GENERAL.

A. Fabricated items which are indicated on the Drawings but not mentioned specifically herein shall be fabricated in accordance with the applicable requirements of this section.

1.3 SUBMITTALS.

A. General

1. Complete data, detailed drawings, and setting or erection drawings covering all materials shall be submitted in accordance with the Submittal Procedures section. Each separate piece shall be marked.

2. Railing drawings shall be sealed by a professional engineer registered in the state of the project.

3. Data shall be submitted to certify that railings meet all applicable requirements of the codes as specified herein and the Specifications and Drawings. Engineer may request copies of all supporting calculations.

B. Samples.

1. Samples shall be submitted to indicate finishes. Samples of each type of fitting required to complete the installation shall also be submitted.

C. Colors.

1. Where color selections are required, color charts shall be submitted showing the full range of available colors. Procedures for selecting colors shall be as indicated in the Submittal Procedures section.

PART 2 - PRODUCTS

2.1 GENERAL.

A. Railing systems shall be designed and fabricated by companies normally engaged in the manufacture of such systems. Railing products shall be from a single supplier and the installed systems shall have a uniform appearance throughout the project.

B. At Contractor's option, handrailing and guardrailing shall be either shop fabricated welded systems or prefabricated nonwelded systems designed for field assembly. Welded railing systems shall be fabricated from pipe and accessories by metal fabricators experienced in designing and fabricating welded railing.

2.2 PERFORMANCE AND DESIGN REQUIREMENTS.

A. Railing System Design Criteria.

1. All railing systems shall be designed and fabricated in compliance with the most stringent requirements of the applicable local building code, OSHA 29 CFR Part 1926 Subpart R, and all other pertinent OSHA regulations and local safety regulations.

2. Handrails for handicapped accessible areas shall comply with the requirements of the local building code, ANSI 117.1 Uniform Federal Accessibility Standards, and the accessibility standards of the Americans with Disabilities Act.

3. In case of conflicting requirements the more stringent requirements shall be applicable.

4. At a minimum, guardrailing and handrailing shall be designed to withstand a uniform load of 50 lb per ft applied in any direction at the top, and a concentrated load of 200 lb applied in any direction at any point along the top. The uniform load and the concentrated load need not be assumed to act concurrently. The design load shall be transferred through the entire railing system and its attachment to the structure.

5. Intermediate rails, including balusters on picket-type systems, shall be designed to withstand a horizontally applied normal load of 50 lb on an area not to exceed 12 inches by 12 inches including openings and space between rails. The load shall be located so as to produce the maximum effects. Reactions due to this loading are not required to be superimposed with the loads specified for the top rail and handrail.

6. An allowable stress increase of 1/3 shall not be incorporated into the design of any part of the railing system.

7. Maximum spacing for railing posts shall be 6 ft.

B. Steel Rails.

1. Handrails and guardrails shall be fabricated from 1-1/2 inch ID steel pipe. Pickets shall be fabricated from 3/4 inch ID steel pipe.

C. Aluminum Rails.

1. Handrails and guardrails shall be fabricated from 1-1/2 inch ID aluminum pipe. Pickets shall be fabricated from 3/4 inch ID aluminum pipe.

D. Kickplate.

1. Kickplates shall be four inches high and shall be fabricated from similar materials as the railing. Kickplates shall clear the walking surface by 1/4 inch.

E. Fasteners.

1. Unless noted otherwise, all fasteners shall be stainless steel. Where galvanized bolts are indicated on the Drawings or specified, the use of zinc-plated bolts will not be acceptable. Railings shall be fastened to fittings with through bolts or flush set screws; glued or pop riveted connections are not permitted. Fastener details shall be indicated on the submittal drawings.

F. Guarding of Openings.

1. Openings in railing shall be guarded by self-closing gates in accordance with OSHA 1910.23. Gates shall be the product of a manufacturer specializing in the design of safety systems.

G. Removable Guardrail.

1. Removable guardrail sections shall be designed so that each section has at least two, but not more than three posts.

H. Expansion Control.

1. Guardrailing in outdoor locations shall have slip joints at least every 60 ft and at all concrete expansion joints to permit expansion and contraction. The gap at each slip joint shall be not less than 1/4 inch.

I. Mounting to Structure.

1. Railing systems shall be mounted to structures as indicated on the Drawings. If mounting details are not indicated, railing posts shall be surface mounted with base flanges or side mount brackets secured to concrete by stainless steel adhesive anchors. Bolt sizes and pattern shall be as needed for the mounting device.

2.3 ACCEPTABLE MANUFACTURERS.

A. Metal railing shall be by Julius Blum & Co, Thompson Fabricating, Kee Industrial Products, VIVA Railings, or approved equal.

2.4 MATERIALS.

Aluminum Systems

Pipe	ASTM B429, Alloy 6063-T6, Schedule 40 minimum thickness.
Plates	ASTM B209, Alloy 6061-T6.
Fittings, Welded	Angles, offsets, tees, ells, crosses, caps for aluminum, ASTM B429, Alloy 6063-T6, Schedule 40 minimum thickness.
Fittings, Non-welded	Manufacturer's standard component fittings, extruded sections, ASTM B221, Alloy 6063-T5/T52.
Assembly Bolts, Nuts, Washers, and Fasteners	Stainless steel.

Stainless Steel Systems

Pipe	ASTM A312, Grade TP316L, Schedule 40 minimum thickness.
Plates	ASTM A240, Type 316L.
Fittings, Welded	Angles, offsets, tees, ells, crosses caps for stainless pipes shall be made with formed, stainless steel welding ells and welding connectors.
Non-welded	Manufacturer standard component fittings, stainless steel.
Assembly Bolts, Nuts, Washers, and Fasteners	Stainless steel.

Galvanized Steel Systems

Tubing	ASTM A500 Grade B, Schedule 40 minimum thickness, galvanized after fabrication.
Pipe	ASTM A53, Type F or S, Grade A, Schedule 40 minimum thickness, galvanized after fabrication.
Plates	ASTM A36, galvanized.
Fittings, Welded	Angles, offsets, tees, ells, crosses, and caps shall be made with formed, welding ells and welding connectors. Material to match railings, and shall

	be galvanized.
Fittings, Non-Welded	Manufacturer standard component fittings, material to match railings, and shall be galvanized.
Assembly Bolts, Nuts, Washers, and Fasteners	Stainless steel.
Painted Steel Systems	
Tubing	ASTM A500 Grade B, Schedule 40 minimum thickness, prime painted.
Pipe	ASTM A53, Type F or S, Grade A, Schedule 40 minimum thickness, prime painted.
Plates	ASTM A36, prime painted.
Fittings, Welded	Angles, offsets, tees, ells, crosses, caps shall be made with formed, welding ells and welding connectors. Material to matching railings, and shall be prime painted.
Fittings, Non-welded	Manufacturer standard component fittings, materials to match railings, and shall be prime painted.
Assembly Bolts, Nuts, Washers, and Fasteners	Manufacturer's standard.
Steel Pipe Sleeves	
Outer Sleeves	Black steel pipe, Schedule 40. Hot-dip galvanized after fabrication.
Removable Post Inner Sleeves	PVC tube, Schedule 40.
Plastic Pipe Sleeves	PVC tube, Schedule 40.
Post Setting Cement	Minwax "Super Por-Rok Cement" or Master Builders Solutions "MasterEmaco T 545".
Anchorage to Prime Painted Steel	High Strength bolts, nuts, and washers in accordance with the Structural Metals section.
Anchorage to Concrete or Masonry	Stainless steel adhesive anchors in accordance with the Anchorage in Concrete and Masonry section.
Shop Coatings	

Universal Primer	Ameron "Amercoat 385 Epoxy", Carboline "Rustbond", or Tnemec "Series 27 F.C. Typoxy."
Epoxy Enamel	Gray; Ameron "Amerlock 400 High-Solids Epoxy Coating", Carboline "Carboguard 891", or Tnemec "Series N140 Pota-Pox Plus".
Anodic Finish	AA-M10C22A41, clear unless otherwise required.
Galvanizing	ASTM A123, A153, A385.

2.5 FABRICATION.

A. Unless otherwise indicated on the Drawings, all railings provided under this section shall be of the same type and design.

B. Welded Metal Railings.

1. All angles, offsets, or other changes in alignment in welded pipe railings shall be made with railing ells and welded connectors. Welded joints shall be flush type. Railings shall be smooth, with all projecting joints and sharp corners ground smooth. Members shall be neatly coped and continuously welded or mechanically connected at all junctions. Top rails shall run continuously over posts. All rails and posts shall be in the same plane and shall not be offset. All welding shall be done neatly and substantially by a process (e.g., TIG or MIG) producing a smooth weld. All weld spatter and burrs shall be removed, and all welds shall be thoroughly brushed with a stainless steel power wire brush.

2. Field joints shall be made with a splice-lock connector which shall provide a firm, permanent connection. The connector shall mechanically draw the railing sections together to form tight, hairline joint.

C. Guarding of Openings.

1. Openings in railing shall be guarded by self-closing gates. Self-closing gates shall be fabricated of the same materials with the same finish as the guardrailing. The closure device shall be Manufacturer's standard.

D. Sleeves.

1. Sleeves for fixed handrail posts shall be fabricated from Schedule 40 PVC pipe or from Schedule 40 black steel pipe hot-dip galvanized after fabrication. Sleeves shall provide at least 1/4 inch clearance all around each post and shall be 5 inches long unless otherwise indicated on the Drawings.

2. Sleeves for removable posts shall have an outer and inner sleeve. The outer sleeve shall be fabricated from Schedule 40 black steel pipe and shall be hot-dip galvanized after fabrication. The inner sleeve shall be Schedule 40 PVC pipe.

2.6 COATING.

A. Painted Steel.

1. Unless otherwise required, all ungalvanized steel shall be given a coat of universal primer in the shop after fabrication. Steel surfaces shall be prime coated as soon as practicable after cleaning. The dry film thickness of the shop coatings shall be at least 2 mils . Steel railing shall also be finish coated with one coat of epoxy enamel, at least 5 mils dry film thickness. Color of finish coat shall be ***Insert Color***. All painting shall be done in a heated structure if the outside air temperature is below 50°F . Steel shall not be moved or handled until the shop coat is dry and hard.

B. Aluminum.

1. All surfaces of aluminum which will be in contact with concrete shall be coated with bituminous paint. All surfaces of aluminum which will be in contact with dissimilar metals shall have a 15 mil thick sheet of oriented polyester film placed between the two surfaces.

2. All aluminum railings shall be provided with a clear anodic finish.

C. Stainless Steel.

1. Unless otherwise specified or permitted, all items fabricated from stainless steel shall be thoroughly cleaned and degreased after fabrication. Pickling or light blast cleaning shall be used to produce a modest etch and shall remove all embedded iron and heat tint. Surfaces shall be subjected to a 24 hour water test or a ferroxyl test to detect the presence of residual embedded iron and shall be repickled as needed to remove all traces of iron contamination. Surfaces shall be adequately protected during shipping and handling to prevent contact with iron or steel objects or surfaces.

D. Other Surfaces.

1. Shop coating of galvanized steel will not be required.

PART 3 - EXECUTION

3.1 INSTALLATION.

A. When railings are assembled, all posts shall be plumb and longitudinal members shall be parallel with each other and with the floor surface or slope of stairs. In any section or run of railing, the center lines of all members shall be in true alignment, positioned in the same vertical plane. All posts in fixed handrail sections shall be rigidly attached to the supporting structure. After installation, railings shall be checked for final alignment, using a tightly drawn wire for reference. The maximum misalignment tolerance for railings shall be 1/8 inch in 12 ft. Bent, deformed, or otherwise damaged installations shall be replaced.

B. Attachment to Concrete.

1. Posts shall be attached to concrete structures as indicated on the Drawings. Base flanges and side-mount brackets shall be installed with minimal disturbance to the reinforcing steel. Bolts shall be stainless steel adhesive anchors as specified in the Anchorage in Concrete and Masonry section.

2. Sleeves shall be rigidly supported in accurate alignment in the forms and shall be positioned vertically so that the top of each sleeve is approximately 1/2 inch below the finished concrete surface. The position of all sleeves shall be carefully measured before railings are fabricated. When the railing is set, the posts shall be wedged in accurate alignment, and the annular space between the posts and sleeves shall be filled with post setting cement to the top of the steel sleeve. Filling of the remaining space with sealant, as indicated on the Drawings, is covered in the Caulking section.

C. Attachment to Steel or Aluminum.

1. Attachments to steel or aluminum shapes shall be made with flanges or with other special attachments or anchorages as detailed on the Drawings.

D. Removable Attachments.

1. For removable guardrail sections in embedded sleeves, inner sleeves shall be set in outer sleeves in the same manner as specified herein for the setting of fixed posts. Particular care shall be taken to ensure that the inner sleeves are accurately spaced and plumbed, so that the guardrail sections, when set in position, will stand in proper alignment and will be removable without binding.

2. Removable guardrail sections with base flanges or side mount brackets shall be secured in the bases with removable screws.

E. Wall Mounted Handrailing.

1. Suitable wall brackets shall be provided where shown or required. Wall brackets shall be securely anchored to walls with stainless steel adhesive anchors as specified in the Anchorage in Concrete and Masonry section. Expansion anchors shall not be used unless specifically indicated on the Drawings.

F. Connections.

1. Welding connectors and splice locks shall be installed in accordance with the manufacturer's recommendations. Other methods of making connections and changes in alignment will be considered, provided complete information covering the proposed method is submitted to Engineer for review.

End of Section

Section 05530 - METAL GRATINGS

PART 1 - GENERAL

1.1 SCOPE.

A. This section covers the fabrication and installation of metal grating.

B. Both inch-pound (English) and SI (metric) units of measurement are specified herein; values expressed in inch-pound units shall govern.

1.2 GENERAL.

A. Fabricated items which are indicated on the Drawings but not mentioned specifically herein shall be fabricated in accordance with the applicable requirements of this section.

1.3 SUBMITTALS.

A. Items listed in this article shall be submitted for review by Engineer.

1. Detailed fabrication and erection drawings, indicating location of grating supports, profiles, thicknesses, piece lengths and widths, markings of panels, and fastening methods.

2. Clips and anchorage devices information.

1.4 DELIVERY, STORAGE, AND HANDLING.

A. Materials shall be handled, transported, and delivered in a manner which will prevent bends, dents, scratches, or damage of any kind. Damaged materials shall be promptly replaced. Materials shall be stored off the ground.

PART 2 - PRODUCTS

2.1 PERFORMANCE AND DESIGN REQUIREMENTS.

A. Design Criteria.

1. Except as modified herein, the manufacture and fabrication of metal grating shall comply with NAAMM MBG 531 "Metal Bar Grating Manual", and NAAMM MBG 532 “Heavy-Duty Metal Bar Grating Manual”. Grating depth shall be as indicated on the Drawings.

B. Aluminum Grating.

1. Aluminum grating shall be the pressure locked type, with cross bars deformed or swaged to prevent turning. Bearing bars shall be at least 3/16 inch thick flat stock or equivalent I-bars, with center-to-center spacing of 1 3/16 inches . Cross bar center-to-center spacing shall be 4 inches . Grating shall have a mill finish.

2.2 MATERIALS.

Aluminum Grating	ASTM B221, 6061-T6 or 6063-T6 for bearing bars. ASTM B221, 6061-T1 for cross bars.
Grating Stair Treads	Grating stair treads shall match the material and finish of grating in adjacent platforms and floors. Treads shall have a permanently attached or integral non-skid nosing.
Grating Fasteners	Manufacturer's standard, AISI Type 316 stainless steel.
Clips, Bolts, Nuts, Washers	Manufacturer's standard, AISI Type 316 stainless steel.
Welded Threaded Steel Studs	ASTM A108 fully threaded studs automatically welded with compatible nuts and washers; TRW Nelson Type CFL or equal.
Stepped Locking Fasteners	Non-penetrating, non-welded mechanical fasteners, with stainless steel clips and bolts, galvanized cast iron body; Lindapter "Grate-Fast" or Grating Specialty Co. "G-Clip".

2.3 FABRICATION.

A. Grating shall be fabricated in panels that can be easily handled by plant personnel. Unless otherwise indicated on the Drawings, the weight of individual panels shall not exceed 150 lbs . Cross bars and edge bars of adjacent panels shall align. After installation, there shall be not more than 1/4 inch clearance between panels. All bearing bars shall be parallel. Bands and toeplates shall align within 1/8 inch tolerance, vertical and horizontal.

B. All cuts in aluminum grating shall be sawed or sheared.

C. Grating panels shall be arranged so that openings are centered on a joint between panels. Toeplates extending the full depth of the grating and four inches above the top shall be provided around openings. Toeplates shall be welded to each bearing bar. The ends of bearing bars need not be banded unless required by the Drawings. Bands shall

be welded to the first, the last, and every fourth intermediate bar. Bands and toeplates shall be 3/16 inch thick. Crossbars shall be cut off flush with the outside face of side bars.

2.4 SHOP COATING.

A. Finish painting of grating, if required, is covered in the Protective Coatings section.

B. Galvanizing.

1. All galvanizing shall be done by the hot-dip process after fabrication, in conformity with the requirements of ASTM A123, A153, and A385.

C. Aluminum.

1. All surfaces of aluminum which will be in contact with concrete, mortar, or dissimilar metals shall be given a coat of bituminous paint.

PART 3 - EXECUTION

3.1 GENERAL.

A. All grating shall lie flat, with no tendency to rock when installed. Poorly fitting or damaged grating shall be rejected. Grating openings may be field cut with the approval of Engineer, provided that no more than four adjacent bearing bars are cut. If the grating is cut or modified in the field, affected surfaces shall be repaired or sealed to assure restoration of the corrosion resistance of the grating. Field cut openings must be spaced so that there are at least as many continuous bars between each opening as there are cut bars at the opening.

3.2 ATTACHMENTS TO SUPPORTING STRUCTURE.

A. All grating supported on steel or aluminum structures shall be attached. Grating shall be attached to the supporting structure in accordance with the grating manufacturer's recommendations and submittals. Single span grating over openings in concrete may rest unattached in recesses constructed for that purpose.

B. Prime Painted Steel Supports.

1. Unless otherwise required or indicated on the Drawings, clip or flange block fasteners or stepped locking fasteners shall be used to attach grating to prime painted steel supports. Clip fasteners shall be secured to the supporting steel with through bolts in drilled holes. Through bolts shall be stainless steel. Fusion welded threaded studs may be utilized if the primer is removed before welding or if a suitable weldable primer is used. Welded studs shall be cleaned and prime painted to match the support steel prior to finish painting.

C. Galvanized Steel Supports.

1. Unless otherwise indicated on the Drawings, stepped locking fasteners shall be used to attach grating to galvanized steel supports. The galvanized coating shall not be damaged.

D. Stainless Steel and Aluminum Supports.

1. Unless indicated otherwise on the Drawings, clip or flange block fasteners or stepped locking fasteners shall be used to attach grating to stainless steel or aluminum supports. Fasteners shall be secured to the supporting structure with stainless steel through bolts in drilled holes. Welded fasteners shall not be used.

3.3 FINISH TOUCHUP.

A. After erection, all grating shall be cleaned. Damaged coatings shall be touched up in accordance with the grating manufacturer's recommendations to fully restore the corrosion resistance of the grating.

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. Anchors shall be designed for all operating conditions, including wind and seismic loadings when indicated in the Meteorological and Seismic Design Criteria section.

2. Cast-in-place anchors shall be used unless post-installed types are indicated on the Drawings or accepted by Engineer. Post installed anchors into concrete or masonry shall be designed in accordance with the anchor manufacturer's research report.

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.

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 (Epoxy)	Hilti "HIT-RE 500 V3", Simpson "SET-3G", or DeWalt "Pure 110+."
Adhesive (Acrylic)	Hilti "HIT-HY 200 V3", Simpson "AT-XP", or DeWalt "AC200+."

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.

3. Adhesive anchors in hollow CMU masonry and unreinforced brick masonry shall utilize screen tubes as recommended by the manufacturer.

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.

E. Masonry Installation

1. Anchors shall be installed to meet all criteria in the manufacturer's installation instructions and ICC-ES reports, including but not limited to minimum compressive strength at time of installation, minimum edge distances, minimum clearances from mortar joints, minimum anchor spacing, and use of screen tubes.

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 05590 - STRUCTURAL METALS

PART 1 - GENERAL

1.1 SCOPE

A. This section covers the fabrication and erection of structural metal items.

B. Except as otherwise specified or indicated on the Drawings, all work shall conform to the applicable provisions of the AISC "Steel Construction Manual" (15th edition) with the exception of the "Code of Standard Practice for Steel Buildings and Bridges"; and the Aluminum Association "Specification for Aluminum Structures."

C. Special inspection during the fabrication and erection of structural steel, if required by the local building code, is addressed in the Code-Required Special Inspections and Procedures section.

D. Both inch-pound (English) and SI (metric) units of measurement are specified herein; the values expressed in inch-pound units shall govern.

1.2 SUBMITTALS

A. Drawings and Data - General

1. Complete data, fabrication drawings, and setting or erection drawings covering all structural and miscellaneous metal items shall be submitted in accordance with the Submittals Procedures section.

B. Connection and Weld Data

1. All bolted connections and welds shall be properly identified on the shop drawings. Welding procedures, welding procedure qualification records and welder qualifications shall be submitted.

C. Bolts and Washer Data

1. Submittals for high strength bolts, tension control bolts and load indicator washers shall include statements from the bolt and washer manufacturers certifying satisfactory compliance with the governing standards and the specified tests.

D. Drawings and Data – Design

1. Submittals for items that are designed by the fabricator shall include drawings sealed by a professional engineer registered in the state of the project. Data shall include confirmation that the design meets all applicable code requirements. Calculations shall be submitted when requested by Engineer.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Materials shall be handled, transported, and delivered in a manner which will prevent bends, dents, significant coating damage, or corrosion. Damaged materials shall be promptly replaced. Structural metal work shall be stored on blocking so that no metal touches the ground and water cannot collect thereon. The material shall be protected against bending under its own weight or superimposed loads.

B. Bolting materials shall be stored indoors. Weld rod shall be stored in accordance with the supplier's instructions and AWS D1.1.

1.4 FABRICATOR QUALIFICATION

A. All fabricating plants providing structural steel shall be qualified fabricators who participate in the AISC Certification program and are designated an AISC Certified Plant, Category BU.

PART 2 - PRODUCTS

2.1 GENERAL

A. All materials needed for both shop and field assembly shall be furnished.

2.2 MATERIALS

Steel

Shapes (W, WT)	ASTM A992.
Shapes (S, M, HP, C)	ASTM A36 or ASTM A572 Grade 50.
Other Shapes (angles)	ASTM A36.
Plates and Bars	ASTM A36.
Sheets	ASTM A1008 CS Type B or A1011 CS Type B.
Pipe	ASTM A53, Type E or S, Grade B (F_y = 35 ksi).
Round Structural Tubing	ASTM A500, Grade C (F_y = 46 ksi).
Square and Rectangular Structural Tubing	ASTM A500, Grade C (F_y = 50 ksi).
Bolts and Nuts	
Bolts, High Strength	ASTM F3125, Grade A325.
Bolts, Tension Control Type (Twist off)	ASTM F3125, Grade 1852.
Bolts, unfinished	ASTM A307.
Nuts, Heavy-Hex	ASTM A563, grade and finish compatible with bolts.

Nuts, Self-Locking	Prevailing torque type; IFI-100, Grade A.
Washers	
Flat, Hardened	ASTM F436, Type 1.
Lock	ANSI/ASME B18.21.1, helical spring type.
Beveled	ASTM F436.
Load Indicator	ASTM F959, compressible-washer-type direct tension indicator; type compatible with bolts tested in accordance with Article 10.2 of ASTM F959.
Threaded Rods (Including Hanger Rods for Pipe Supports)	ASTM A36. Threaded rods shall have sufficient threading to permit the maximum adjustment available. Continuously threaded rod is not acceptable for rods over 12 inches in length.
Forged Steel Sleeve Nuts	AISI C-1018, Grade 2.
Stainless Steel	
Shapes	ASTM A1069 or A276, Type 316L.
Plates	ASTM A240, Type 316L.
Pipe	ASTM A312, Grade TP316L.
Tube	ASTM A269, Grade TP316L.
Bolts	ASTM F593, Alloy Group 1 or 2, minimum yield strength of 45 ksi.
Nuts	ASTM F594, Alloy Group shall match that of the bolts. Nuts shall have a minimum proof stress equal to or greater than the minimum full-size tensile strength of the bolts.
Washers	
Flat	ANSI/ASME B18.22.1, Type 316.
Lock	ANSI/ASME B18.21.1, helical spring type, Type 316.
Threaded Rods (Including Hanger Rods for Pipe Supports)	ASTM A593, Alloy Group 1 or 2, minimum yield strength of 45 ksi.
Aluminum	
Sheet and Plate	ASTM B209, Alloy 6061-T6.
Rolled Sections	ASTM B308, Alloy 6061-T6. All members shall be Aluminum Association standard shapes. Special shapes with sloping flange surfaces, or Army-Navy type members, shall not be used unless specifically indicated on the Drawings.
Rod and Bar (Rolled or Drawn)	ASTM B211, Alloy 6061-T6 or 2017-T4.

Extrusions	ASTM B221, Alloy 6063-T5 or T6.
Pipe	ASTM B429, Alloy 6061-T6.
Rivets	ASTM B316, Alloy 6061-T6.
Bolts, Aluminum	ASTM F468, Alloy 2024-T4.
Nuts, Aluminum	ASTM F467, Alloy 6061-T6.
Washers, Aluminum	
Flat	ANSI/ASME B18.22.1, Type 6061 T-6.
Lock	ANSI/ASME B18.21.1, helical spring type, Type 6061-T6.
Weld Metal (Steel Connections)	ANSI/AWS D1.1, Table 3.1, filler metal with minimum 70 ksi tensile strength unless otherwise required.
Rails	
Crane	ASTM A1.
Railroad	ASTM A1.
Shop Coatings	
Universal Primer	As indicated in the Protective Coatings section.
Bituminous Paint	Metal fabricator's standard product.
Galvanizing	ASTM A123, A153, A385, and F2329 as applicable.

2.3 STAIRS

A. Stairs shall be fabricated to the dimensions, arrangements and sizes indicated on the Drawings. Stairs shall be true to line and slope, shall be rigidly supported, and shall be braced and tightened to prevent movement. All treads shall be level and in perfect alignment and spacing.

B. After installation, stairs shall be rigid and shall not sway noticeably or deflect under foot traffic. If necessary to prevent noticeable movement, additional supports or bracing shall be provided.

C. Stair Design

1. Stairs shall be designed by the stair supplier in general accordance with details indicated on the Drawings. The design shall comply with all applicable provisions of the local building code, ANSI A117.1, and OSHA as applicable. The drawings shall be sealed by a professional engineer registered in the state of the project. If requested, sealed calculations shall be submitted to Engineer.

2. The completed fabrications shall support a uniform live load of 100 lbs per square foot and a concentrated load of 300 lbs applied at the center of the span. Individual treads and platforms shall be designed to support a uniform live load of 100 lbs per square foot or a 300 lb concentrated live load applied on an area of 4 square inches. Vertical deflections

under full live load shall be limited to span/240. Stairs and landings shall be braced or otherwise designed to avoid noticeable sidesway.

3. The stair design and details shall be coordinated with the handrailing and guardrailing supplied. Stair members shall be adequate to accept loads from the rail posts based upon the criteria in the Metal Railings section.

4. Connections between the stair members and the supporting structure shall be adequate to transfer all loadings, and shall be designed in accordance with all applicable provisions of the AISC manual and ACI 318 Chapter 17. The number and type of connections shall comply, at a minimum, with the Drawings. All necessary brackets, bolts, and anchors shall be provided.

D. Nosings

1. All stair treads shall have non-skid nosings, either fabricated integrally with the tread or attached with stainless steel bolts and self-locking nuts.

E. Grating Stairs

1. Treads shall be fabricated from grating material in accordance with the Metal Gratings section.

F. Pan Type Stairs

1. Risers and subtreads shall be fabricated from 12 USS gage steel and subplatforms from 10 USS gage steel. Fill depth shall be 2 inches for treads and 3 inches for platforms. Each riser shall have an integral non-slip nosing and a formed sanitary cove, located so that the toe of the cove will be at the surface of the concrete fill or applied finish.

G. Cast Aluminum Stairs

1. Risers and subtreads shall be fabricated from cast aluminum as indicated on the details on the Drawings.

2.4 STRUCTURAL STEEL BOLTED CONNECTIONS

A. Bolt holes shall have a diameter nominally 1/16 inch larger than the nominal bolt diameter. Bolt holes for one ply of vertical diagonal bracing connections may be oversized to a diameter nominally 3/16 inch larger than the nominal bolt diameter.

2.5 SHOP COATING

A. All items shall be shop coated as specified herein. The requirements for field painting are covered in the Protective Coatings section.

B. Contact surfaces of structural steel slip critical bolted connections shall not be shop coated. Contact surfaces of structural steel bearing type bolted connections may be shop coated.

C. Cleaning

1. Surfaces shall be dry and of proper temperature when coated, and shall be free of grease, oil, dirt, dust, grit, rust, loose mill scale, weld flux, slag, weld spatter, and other objectionable substances. Articles to be galvanized shall be pickled before galvanizing. All other ferrous metal surfaces shall be cleaned by solvent, high-speed power wire brushing or by blasting to the extent recommended by the paint manufacturer and as required in the Protective Coatings section.

D. Edge Grinding

1. Sharp projections of cut or sheared edges of ferrous metals which will be submerged in operation, except for items specified to be hot-dip galvanized, shall be ground to a radius as needed to ensure satisfactory paint adherence and as required in the Protective Coatings section.

E. Prime Painted Steel

1. Unless otherwise specified or indicated on the Drawings, all ungalvanized steel shall be given a shop coat of universal primer after fabrication. The dry film thickness of the universal primer shall be at least 5 mils. Steel surfaces shall be prime-coated as soon as practicable after cleaning. Steel shall not be moved or handled until the shop coat is dry and hard.

F. Galvanizing

1. Steel materials required to be galvanized are indicated on the Drawings. All galvanizing shall be done by the hot-dip process after fabrication. An approved zinc-rich paint shall be used to touch up minor coating damage, in accordance with ASTM A780. Materials with significant coating damage shall be regalvanized or replaced.

2. Bolts, nuts, and washers shall be galvanized when connected materials are galvanized or where indicated on the Drawings. The use of zinc-plated bolts will not be acceptable.

G. Stainless Steel

1. Unless otherwise specified, all items fabricated from stainless steel shall be thoroughly cleaned and degreased after fabrication. Pickling or a light blast cleaning shall produce a modest etch and remove all embedded iron and heat tint. Surfaces shall be subjected to a 24 hour water test or a ferroxyl test to detect the presence of residual embedded iron and shall be retreated as needed to remove all traces of iron contamination. Surfaces shall be adequately protected during shipping and handling to prevent contact with iron or steel objects or surfaces.

H. Aluminum

1. All surfaces of aluminum which will be in contact with concrete, mortar, or dissimilar metals shall be given a coat of bituminous paint.

PART 3 - EXECUTION

3.1 STRUCTURAL STEEL ERECTION

A. Structural steel shall be erected so that individual pieces are plumb, level, and aligned within a tolerance of 1:500. The elevations of the top of floor and roof members shall be within 1/16 inch of the elevations indicated on the Drawings. The faces of girts and other supporting members for rigid wall panels shall be in vertical planes within a maximum variation of 1/8 inch.

B. All members and parts, as erected, shall be free of warps, local deformations, and unauthorized bends. All parts shall be assembled accurately as indicated on the Drawings. Light drifting will be permitted to draw parts together, but drifting to match unfair holes will not be permitted. Any enlargement of holes necessary to make connections in the field shall be done by reaming with twist drills and only with the approval of Engineer. Enlarging holes by burning will not be permitted.

C. Baseplates shall be set level in exact position and grouted in place.

D. Inspection and Testing

1. Special inspection will be performed as indicated in the Code Required Special Inspections and Procedures section. The erector shall provide access as needed to facilitate all inspections and shall provide timely notification during erection when inspection milestones are approaching.

E. Crane Rails

1. Crane rails shall be installed level and in accurate alignment and shall form a continuous, smooth track. Rail installation tolerances shall be in accordance with CMAA Specification 70.

3.2 STRUCTURAL STEEL BOLTED CONNECTIONS

A. Unless otherwise indicated on the Drawings, bolted connections for structural steel, as defined in the AISC manual, shall be made with ASTM F3125 high strength bolts conforming to the “Specification for Structural Joints Using High-Strength Bolts” as approved by the Research Council on Structural Connections. The method of installation, pretensioning procedures, bolting equipment and tools shall likewise conform to the above referenced standard.

B. When assembled, all joint surfaces, including those adjacent to the bolt heads, nuts, or washers, shall be free of loose mill scale, dirt, burrs, oil, and other foreign material that would prevent solid seating of the parts.

C. Beveled washers shall be used when the bearing faces of bolted parts have a slope of 1:20 or greater with respect to a plane perpendicular to the bolt axis. Bolt length shall be increased as needed to accommodate the beveled washers.

D. Tightening of each connection assembly shall progress systematically from the most rigid part of the joint toward the free edges until all have been sufficiently rotated or the load indicator washers on all bolts have been closed to the average gap stipulated by the load indicator washer manufacturer.

E. Except as otherwise indicated on the Drawings or specified herein, bolted connections shall be bearing type with threads excluded from the shear plane. Slip critical connections shall be used in diagonal bracing connections, where oversize holes or slotted holes parallel to the direction of the load are used, and where indicated on the Drawings.

F. Bolts in all structural steel connections, both bearing and slip critical, shall be fully pretensioned in accordance with the AISC standards unless specifically noted otherwise on the Drawings. The calibrated wrench method of pretensioning bolts will not be acceptable. Acceptable pretensioning methods are as follows:

Connection Type	Acceptable Pretensioning Method
Bearing	Turn of the nut method and load-indicator washers are acceptable. Tension control (twist-off) type bolts may be used only if approved by Engineer.
Slip-Critical	Load indicator washers.

G. Turn of the Nut Method

1. The bolt, nut, and material shall be match marked. A wax lumber marker or paint shall be used to clearly mark the assembly.

H. Load-Indicator Washers

1. Load indicator washers shall be installed in accordance with the manufacturer's recommendations, as supplemented herein. To facilitate proper tightening of fastener assemblies with load indicator washers, a hardened flat washer shall be installed under the turned element (bolt head or nut) and between the turned element and the load indicator washer protrusions, in all cases. Whenever possible, the load indicator washer shall be installed on the head end of the bolt. If the bolt head will not be visible for inspection of the indicator washer after installation, or if the bolt head must be turned to tighten the assembly, the load indicator washer may be installed on the nut end of the bolt.

I. Tension Control (Twist-off) Bolts

1. Patented tension control bolts shall be of equivalent size and strength to the indicated high strength bolts, and shall be installed in strict accordance with the manufacturer's instructions. Load-indicator washers are not required on tension control bolts.

3.3 STRUCTURAL AND STAINLESS STEEL WELDING

A. Welding and related operations shall conform to applicable provisions of AWS D1.1 for steel and AWS D1.6 for stainless steel. All welding shall be performed in accordance with written procedures, using only those joint details which have prequalified status. All welding shall be performed by welders qualified in accordance with the American Welding Society.

B. Welds not dimensioned on the Drawings shall be sized to develop the full strength of the least strength component of the connection.

C. All butt and miter welds shall be continuous and, where exposed to view, shall be ground smooth. Intermittent welds shall have an effective length of at least 2 inches and shall be spaced not more than 6 inches apart.

D. Surfaces within 2 inches of a weld shall be free from loose or thick scale, slag, rust, moisture, grease, paint and other foreign materials that would prevent proper welding or release objectionable fumes.

E. Only shielded metal arc, gas metal arc, flux cored arc, submerged arc, and gas tungsten arc welding are permitted. For flux cored arc welding, only E70xx one (1) or five (5) wire electrodes with supplemental gas shielding shall be permitted. Use of electroslag or electrogas welding processes or the short-circuiting transfer mode of the gas metal arc process will not be acceptable.

F. Field welded connections shall not be substituted for field bolted connections indicated on the Drawings.

3.4 STRUCTURAL ALUMINUM

A. Unless otherwise noted, all work shall conform to applicable provisions of the Aluminum Association “Specification for Aluminum Structures.”

B. Connections

1. Connections not specifically detailed on the Drawings shall develop the full strength of the least strength member of the connections. Bolted connections shall be all-bolted bearing type, equipped with a helical spring lock washer under the stationary element (bolt head or nut) and a flat washer under the turned element. All bolts shall be fully tightened. Bolts and nuts for structural aluminum connections shall be stainless steel. A sufficient number of bolts shall be provided in each connection to develop the shear strength of the member.

2. Welded connections shall be made in accordance with the American Welding Society D1.2, Structural Welding Code - Aluminum. All welding shall be performed by welders qualified in accordance with American Welding Society. Welds shall be free of porosity, cracks, holes, and flux. Welded connections shall not be substituted for bolted connections without prior approval of Engineer.

C. Erection

1. Structural aluminum shall be erected so that individual pieces are plumb, level, and aligned within a tolerance of 1:500. The elevation of horizontal members shall be within 1/16 inch of the elevation indicated on the Drawings.

End of Section

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. 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 1-09940 and 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
P	PVC and FRP	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."

C. Color Submittals

1. The manufacturer's standard colors will be acceptable for all coatings.

1.4 QUALITY ASSURANCE

A. Coating System Data Sheet Certifications

1. The coating applicator and coating manufacturer shall review and approve in writing the coating manufacturer's written recommendations for the coating system and the intended service. Any variations from the Specifications or the coating manufacturers published recommendations shall be submitted in writing and approved by the coating manufacturer.

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 intermediate and finish coating materials that will be in contact with wastewater atmosphere shall be guaranteed by the manufacturer to be fume proof and suitable for wastewater plant atmosphere that contains hydrogen sulfide. Coatings that cannot be so guaranteed shall not be used. Leadfree, chromium-free, and mercury free coatings shall 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. Fillers and Surfacers – Not Used.

H. Intermediate and Finish Coatings

Epoxy

Concrete Floors	PPG "Amerlock 2/400," Carboline "Carboguard 890," International Devoe "Devran 224V," Tnemec "Series N69 Hi-Build Epoxoline II," or Sherwin-Williams "Armorseal 1000HS"; nonskid.
Ferrous Metal Surfaces and Masonry or Concrete Surfaces Other Than Floors	PPG "Amercoat 385 Epoxy," Carboline "Carboguard 890," International Devoe Devran "224V," Tnemec "Series N69 Hi-Build Epoxoline II," or Sherwin-Williams "Dura Plate 235."
Flake-Filled Epoxy	PPG Novaguard 890 FF, Carboline "Plasite 4500/4500S," Sherwin-Williams "Sher-Glass FF,", Tnemec "Series 142 Epoxoline." or International "Interzone 954GF".
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"
Medium Consistency Coal Tar	PPG Amercoat 240 Black, Carboline "Bitumastic 50" International "Devoe Bar-Rust 236 Black" or Tnemec "46-465 H.B. Tnemecol."
Vinyl Ester	Tnemec "Series 120 Vinester" Carboline "Plasite 4110" or Sherwin-Williams "Magnalux 304FF." International Paint «Ceilcote 232 Flakeline »

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. All concrete surfaces shall be free of objectionable substances and shall meet the coating manufacturer's recommendations for surface preparation. Concrete surfaces shall be prepared in accordance with SSPC-SP13/NACE 6. Any other surface preparation recommended by the coating material manufacturer shall be brought to Engineer's attention and may be incorporated into the work if acceptable to Engineer.

2. All concrete surfaces shall be dry when coated and free from dirt, dust, sand, mud, oil, grease, and other objectionable substances. Oil and grease shall be completely removed by use of solvents or detergents before mechanical cleaning is started.

3. New concrete shall have sufficiently cured for at least 4 weeks or reached moisture content levels at or below the material manufacturer's requirements before coating is applied. Concrete surfaces shall be tested for capillary moisture in accordance with ASTM D4263. There shall be no capillary moisture when coatings are applied on concrete.

4. All surfaces to be coated shall be cleaned and prepared in accordance with the printed manufacturer's requirements or ASTM D4258 and abraded in accordance with ASTM D4259. Surface profile shall be at least 25 percent of the dry film thickness specified for the coating system. Prior to application of the coating, the surfaces shall be thoroughly washed or cleaned by air blasting to remove all dust and residue. Spalled areas, voids, and cracks shall be repaired in accordance with the Concrete section and as acceptable to the Engineer. Fins and other surface projections shall be removed to provide a flush surface before application of coating.

5. Except where epoxy is applied as damp-proofing, the concrete surfaces, including those with bug holes less than 1 inch in any dimension, shall be prepared as recommended by the manufacturer, using an epoxy concrete filler and surfacer. Where coating with a vinyl ester the concrete filler and surfacer shall be as recommended by the manufacturer to be compatible with vinyl ester.

G. Concrete Block Surfaces – Not used.

H. Copper Tubing- Not used.

I. Plastic Surfaces- Not used.

J. 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.

K. 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.

L. Stainless Steel

1. When a coating system is required, surface preparation shall conform to the coating manufacturer's recommendations.

M. Existing Coated Surfaces.

1. Existing surfaces which are anticipated to be modified or disturbed by the Work have been tested for lead and chromium and the results are presented in the existing Hazardous Environmental Condition report identified in the Supplemental Conditions. Some surfaces tested positive for lead and chromium. As indicated in the Project Requirements section, Contractor shall abate all paint, protective coatings, and linings containing detectable quantities of lead, chromium, or other heavy metals that are in areas potentially impacted, damaged, or disturbed during execution of the Work.

2. Existing Piping. Not used.

3. Existing Concrete and Concrete Block Surfaces. Not used.

4. Existing Equipment Surfaces. Existing surfaces of equipment that is modified shall be prepared as indicated above for non-immersion or immersion service as applicable.

3.2 Other Existing Coated Surfaces. Other existing coated surfaces which are indicated on the drawings to be recoated shall be prepared in accordance with the coating manufacturer's recommendations.

3.3 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.

3.4 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.

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. When used, the application of vinyl ester coating system, including time limits for recoating and temperature requirements of the materials, shall conform to the recommendations of the coating manufacturer.

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 .
Other surfaces (two coats)	10 mils .
Immersion service (three coats)	15 mils .
Flake-filled epoxy (two coats)	30 mils .
Vinyl ester	30 mils .
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. 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,

4. Vinyl ester coating materials, when required, shall be maintained during transportation, storage, mixing, and application at the temperature required by the coating manufacturer, 35° F to 90° F .

3.5 REPAIRING FACTORY FINISHED SURFACES

A. Factory finished surfaces damaged prior to acceptance by City 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.

3.6 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 City, coated with two coats of masonry coating.

3.7 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.

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- Not Used.

F. Adhesion Testing – Not Used.

3.8 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). 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	
Epoxy	Same as finish coats.
Coal tar coating	Same as finish coats.
Vinyl ester	Same as finish coats.
Steel and cast iron, surfaces to be coated with	
Epoxy	Same as finish coats or inorganic zinc.
Coal tar coating	Same as finish coats.
Aluminum	Epoxy.
Concrete, surfaces to be coated with epoxy	
For damp-proofing	Epoxy.
For all other surfaces	Epoxy concrete filler and surfacer.

B. Unless otherwise recommended by the coating manufacturer or specified herein, priming will not be required on concrete, or concrete block, nor on metal surfaces specified to be coated with coal tar epoxy, and heat-resistant coatings. Concrete surfaces to be coated with epoxy shall be filled with epoxy concrete filler and surfacer so that a continuous film is obtained, except where concrete is damp-proofed with epoxy.

3.9 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	P
1.	Epoxy – One coat	x			x	
2.	Epoxy – Two coats	x	x	x	x	x
3.	Epoxy / NSF – Two coats	Not Used				
4.	Epoxy – Three coats	x	x	x		
5.	Epoxy / NSF – Three coats	Not Used				
6.	Epoxy – First coat Aliphatic polyurethane – Finish coat	Not Used				
7.	Epoxy – First and second coat Aliphatic polyurethane – Finish coat	Not Used				
8.	Universal primer – First coat Aliphatic polyurethane – Finish coat	x		x		
9.	Medium consistency coal tar – Two coats	Not Used				
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. Hot dipped galvanized fabrications, including fabricated pipe supports, except where specifically noted. Rubber and plastics, except as specified.
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. Other 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 except stainless steel on the digester cover.
c. Other items as otherwise specified.

3.10 METAL SURFACES COATING SCHEDULE

Surfaces to be coated shall include new work, including City 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
Steel handrails, steel floor plates.	A8
Steel yard lighting poles exposed to view or to the elements.	A8
Cast Iron and steel piping inside buildings, including piping to be insulated, valves, fittings, flanges, bolts, pipe support, hangers, and accessories.	A2
Pipe supports, hangers, bolts, and accessories inside buildings	A2
Cast Iron and steel piping in immersion service including inside buildings, including valves, fittings, flanges, bolts, pipe support, hangers, and accessories	A4
Pipe supports, hangers, bolts, and accessories in immersion service including inside buildings	A4
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.	A10
Miscellaneous castings, including manhole rings and covers, and manhole steps. (One coat, if not shop coated.)	A10
Cast iron and steel piping in manholes, wetwells, grit basin, aeration basin, and similar locations, including valves fittings, flanges, bolts, supports, and accessories.	A10
All metal harness anchorage for buried piping.	A10
Supports and miscellaneous metal for equipment handling corrosive chemicals.	Outdoor – A6 OR A7 Indoor – A2
Aluminum in contact with concrete.	F1

3.11 CONCRETE AND MASONRY SURFACES COATING SCHEDULE- Not Used.

3.12 MISCELLANEOUS SURFACES COATING SCHEDULE

Surface To Be Coated	Finish Coating System
Plastic Surfaces, including PVC and FRP.	Indoor – P2

3.13 PIPING IDENTIFICATION SCHEDULE – Not used

End of Section

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

SHOP PRIMED SURFACE DESCRIPTION SYSTEM NO. - -F

SURFACE PREPARATION DESCRIPTION
☐ Solvent SSPC-SP1
☐ Other

COATING	**DFT mils**	**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

SECTION 11319 - IN-LINE GRINDER

PART 1 - GENERAL

1.1 SCOPE

A. This section covers furnishing and installing in-line grinders as follows:

Number of grinders.	1
Grinder tag numbers.	GRD-021110
Grinder location.	Turkey Creek Pump Station Intermediate Level
Service.	Digested Sludge

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 detail drawings, specifications, engineering data, instructions, and recommendations of the equipment manufacturer unless exceptions are noted by the Engineer. The grinder shall be furnished complete with all control equipment, accessories, and appurtenances specified, indicated on the drawings, or otherwise required for a complete, properly operating installation.

B. General Equipment Stipulations. Unless noted otherwise, the General Equipment Stipulations shall apply to all equipment furnished under this section. If requirements in this section differ from those in the General Equipment Stipulations, the requirements specified herein shall take precedence.

C. Seismic Design Requirements. Seismic design requirements for products specified herein shall be as indicated in the Meteorological and Seismic Design Criteria section.

D. Power Supply. Power supply to the equipment will be 480 volts, 60 Hz, 3 phase.

E. Tagging. Each item of equipment and each part shipped separately shall be tagged as indicated in the equipment schedule 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. Qualification Submittal Before Award. The Bidder shall submit within 14 days after the Bid opening and before the Contract is awarded, sufficient information to establish the qualifications of the in-line grinding equipment manufacturer. The information shall include, but not be limited to, operating data and experience records from at least three operating installations with similarly sized in-line grinding equipment. The installations shall have operated successfully in similar service conditions with the proposed equipment , meeting or exceeding the performance and design requirements specified. Names and telephone numbers

of contacts at each installation shall be provided. Failure to submit this information may result in the Bid being considered non-responsive.

G. Identification. Equipment furnished under this section shall be identified in accordance with the Equipment and Valve Identification section.

1.3 SUBMITTALS:

A. Drawings and Data

1. Complete assembly, mounting, schematic and wiring diagrams, and installation drawings, together with detailed specifications and data covering materials used, parts, devices, and other accessories forming a part of the equipment furnished, shall be submitted in accordance with the Submittals Procedures section.

2. The data and specifications shall include, but shall not be limited to, the following:

a. Grinder
   1) Manufacturer.
   2) Type and model.
   3) Rotative speed.
   4) Size of suction connection.
   5) Size of discharge connection.
   6) Type of bearings and bearing manufacturer and number.

b. Motor
   1) As specified in the Common Motor Requirements for Process Equipment section.

c. Motor Starter and Controls
   1) Name of manufacturer.
   2) Type and size.
   3) Wiring and schematic diagrams.

d. Sequence of Operation
   1) A recommended sequence of operation including values and ranges for time delays, speeds, and other set points.

B. Operation and Maintenance Data and Manuals. 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 instruction or parts lists packed with or attached to the equipment when delivered.

1.4 QUALITY ASSURANCE

A. Balance. 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.

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.

1.6 SPARE PARTS AND ACCESSORIES

A. The following spare parts for the grinder shall be furnished in substantial wooden boxes with identifying labels and stored at the plant site as directed by the City.

Spare Parts	Quantity
Complete set of fuses.	1

PART 2 - PRODUCTS

2.1 SERVICE CONDITIONS

A. One dual, rotating shaft, in-line grinder shall be used to reduce particle size of screened raw wastewater pumped from the Turkey Creek Pump Station to the north Rock Box through the recirculation force main.

1. The equipment will be installed in the in-line configuration in a horizontal pipeline as indicated on the drawings. Inlet and outlet connections to the equipment shall be flanged. The motor shall be mounted in a vertical position directly above the pipeline.

2.2 PERFORMANCE AND DESIGN REQUIREMENTS

A. Design Requirements. The grinding equipment shall be designed for the following operating conditions:

Grinder tag numbers.	GRD-021110	
Required flow range through unit.	500-700	gpm
Fluid temperature.	68	°F
Suction condition.	flooded	
Max size of particle passing grinder.	1.5	in
Nominal size of suction and discharge pipe.	6	in

Grinder tag numbers.	GRD-021110	
Max pressure drop through unit.	1.23	psi
Max motor rotative speed	1800	rpm
Max working pressure.	30	psig
Minimum hydrostatic test pressure	45	psig
Max motor rating.	5	hp

2.3 ACCEPTABLE MANUFACTURERS

A. The grinders and controllers shall be supplied by JWC Environmental as manufactured by Disposable Waste Systems, Inc., or Franklin Miller, Inc.

B. The in-line grinder shall be a 30k series 30004T Muffin Monster inline grinder, Taskmaster TM851605 inline grinder, or equal.

2.4 MATERIALS

Body.	Ductile Iron
Shafts.	Hardened alloy steel
Cutters.	Cutters and spacers shall be alloy steel hardened to a minimum Cutters Rockwell HRC 45-52 Spacers Rockwell HRC 34-52 and ground for uniformity. Combination cutter/spacers will not be acceptable. The number of cutters shall be as recommended by the manufacturer. Monolithic cutting blocks shall not be accepted.
Seals.	Mechanical Seal and Bearing Cartridges-Standard Seals and bearing incorporated into a cartridge style design requiring no external seal flush or lubricants to operate wet or dry. Rated for maximum operating pressure: 90 psi. Dynamic and Static seal faces to be Tungsten carbide with 6% nickel binder. Cartridge bushing and housing are AISI 304 stainless steel. O-rings to be Buna-N (Nitrile).

2.5 CONSTRUCTION

A. The grinder shall be of the two shaft design with two parallel shafts alternately stacked with intermeshing cutters and spacers that counterrotate at different speeds.

1. The grinder body shall have a cleanout handhole. Inlet and outlet of the grinder shall not be less than the nominal size of suction and discharge pipe.

2. The grinder shall be provided with flanged inlet and outlet connections, ASTM A536 ductile iron, Class 125. The grinder shall be designed for a hydrostatic pressure of 90psi without leaking.

3. The grinder shall be driven by a direct driven gear reducer assembled as an integral part of the equipment and shall be equipped with mechanical seals.

4. The grinder shall be provided with lifting eyebolts or lugs.

2.6 ACCESSORIES

A. Not used.

2.7 DRIVE UNITS

A. Electric Motors. The motor shall comply with the Common Motor Requirements for Process Equipment section and the following.

1. The motor shall be provided with a totally enclosed fan cooled (TEFC) enclosure and shall include a motor space heater.

2.8 ELECTRICAL

1. Grinders shall be furnished with a control panel which houses the motor starter and controls necessary to operate the grinder. All control panels for grinders shall be in NEMA Type 4X FRP enclosure with 3-position switch and status indicators. Panels and Interior devices shall adhere to the requirements given in the Panels, Consoles, and Appurtenances Section and the Panel Mounted Instruments Section.

2. The control panel shall be provided with a main circuit breaker disconnect with an external operating handle with provisions for up to 3 padlocks. The access door shall be interlocked with the main disconnect so that the door cannot be opened, except by an interlock override, while the breaker is closed. The completed control panel shall have an interrupting rating of at least 65,000 amperes at 480 volts.

3. The motor starter shall be full voltage, reversing, minimum NEMA 1 rated circuit breaker combination type consisting of 3 phase, 60 Hz contactors with thermal overloads, 120 volt ac coils, and circuit breaker disconnect. An external manually reset push button shall be provided for resetting the thermal overload relays.

4. The motor starter circuit breaker shall be 600-volt magnetic motor circuit protector. The breaker shall be manually operated with a quick-make, quick-break, trip-free toggle mechanism.

5. The starter shall include auxiliary contacts as required, plus 2 spare NO and 2 spare NC contacts.

6. The control power transformer shall have both primary leads fused, 1 secondary lead fused, and 1 secondary lead grounded. The control power transformer shall be sized large enough to supply the motor space heater as well as all controls.

7. All push buttons, selector switches, and lights shall meet the following requirements:

    a. Selector Switches
        1) 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”.

    b. Indicating Lights
        1) 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”.

    c. Push Buttons
        1) 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”.

8. The control panel shall have engraved or etched legends ("Run", "Stop", etc.). The nameplate shall be laminated black-over-white plastic, with 1/8 inch engraved letters, and shall be securely fastened to the motor starter.

9. The controls for the grinder shall consist of an "ON-OFF-REMOTE" selector switch; a "RESET" push button; and red run and amber fail indicating lights on the cover. The grinder shall be equipped for control from the plant control system by a remote start isolated contact when the selector switch is in the "REMOTE" position. At the supplier's option, the selector switch, push button, and indicating light functions can be replaced with a digital interface.

10. Controls for dual-rotating shaft grinder equipment shall incorporate an automatic unjamming sequence. The grinder shall automatically reverse rotation at least 3 times in a 30 second period in an attempt to dislodge any obstruction. The sequence shall reset to 0

should 30 seconds expire between any 2 jams. If the obstruction cannot be removed, the equipment shall automatically shut down, and an alarm circuit shall be activated.

11. Isolated contacts shall be available from the grinder's controls to remotely indicate the following conditions:

"ON-OFF-REMOTE" selector switch "IN REMOTE".

Grinder Running.

Grinder Common Fail.

Grinder Jammed.

12. The contacts for alarm and interlock use shall be rated at least 10 amperes, 120 volts ac.

13. Terminals and internal wiring shall be provided in the starter enclosure to accommodate all incoming and outgoing circuits.

2.9 CONTROLS

A. Not used.

2.10 SHOP TESTS

A. Not used.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Installation shall be in accordance with the Equipment Installation section and as specified herein.

1. The grinder shall be installed as indicated on the drawings. The grinder shall be totally supported by the structure and shall not impart any load on the connecting piping.

3.2 FIELD QUALITY CONTROL

A. Installation Check. 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 the Commissioning 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.

1. 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.

2. All costs for these services shall be included in the contract price.An installation check by an authorized representative of the manufacturer is not required.

B. Installation Supervision. Installation supervision by the manufacturer is not required.

3.3 FIELD OR PERFORMANCE TESTING

A. Field or performance testing shall be in accordance with the Commissioning section and as specified herein.

3.4 TRAINING

A. The manufacturer’s representative shall provide training of City’s personnel as described in the Demonstration and Training specification. All costs for training services shall be included in the Contract Price.

End of Section

SECTION 13500 - INSTRUMENTATION AND CONTROL SYSTEM

PART 1 - GENERAL

1.1 SCOPE

A. This section covers the modification of an instrumentation and control system designated as the Supervisory Control and Data Acquisition (SCADA) System.

B. The system shall be modified 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 work includes adding new instruments to the existing system: a new inclinometer and a new velocity transmitter in the weir structure, and new flow and pressure instrumentation for the rock box nozzle system. Adding these instruments requires the addition of one analog input card and one digital input card to the existing remote input-output (RIO) panel, installation and wiring of the new instruments, and modifications to the existing SCADA System, including but not limited to existing gate control logic, existing HMI control screens, database, and reports.

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 13562	FLOW INSTRUMENTS
Section 13563	PRESSURE INSTRUMENTS

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. The Electrical Drawings indicate locations and arrangements of equipment and include installation details and block and one-line diagrams showing connections and interfaces with other equipment. The input/output (I/O) lists are included in the Programmable Logic Controllers section.

2. Principal components of the instrumentation systems shall be as indicated on the electrical plan drawings and 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. Integrator’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 Integrator. The System Integrator shall be regularly engaged in the business of supplying computer-based monitoring, control, and data acquisition systems. The Contractor shall utilize the services of the System Integrator to coordinate all control system related items, to check-out and calibrate instruments, and to perform all testing, training, and startup activities specified to be provided.

2. The following firms have been prequalified for this work and the Contractor shall select one firm from this list as the I&C System Integrator:

RE Pedrotti Company, Inc.
5855 Beverly Ave, Suite A
Mission, KS 66202
913.677.3366

Integrated Controls, Inc.
15707 Mahaffie St.
Olathe, KS 66062
913.782.9600

Durkin, Inc.
2383 Chafee Dr.
St. Louis, MO 63146
314.432.2040

System Suppliers not listed shall not be considered equal or acceptable to utilize on this project.

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. Tagging shall follow the requirements set in SCADA System Software Standards and Conventions, which is included as an attachment to this section.

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 City at completion of startup.

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. Standard field termination drawings for all process input/output equipment, showing typical terminations for each type of point available in the system.

f. A copy of the proposed software licenses for all software associated with the system.

g. Outline for training classes.

h. Additional requirements identified in other Division 13 sections.

C. Second Stage Submittal

1. Before any equipment is released for shipment to the site, 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. 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.

c. 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.

d. Proposed lesson plans or outlines for all training courses specified herein, including schedule, instructors' qualifications and experience, and recommended prerequisites.

e. 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 City 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.

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

1. 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.

2.3 POWER SUPPLY AND INSTRUMENT SIGNAL

A. Power supply to all control system equipment will be 120 volts ac, unless otherwise noted. 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 757 ft.

D. 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 instruments. 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. One complete set of as-built reference documentation for any special software provided specifically for this contract, in PDF format uploaded to eBuilder.

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.

2.6 SOFTWARE LICENSE

A. All software programs supplied as a standard part of System Supplier's products for this project shall be licensed to City for use on the system specified herein. Such license shall not restrict City from using the software on the system provided hereunder or its replacement. City shall have the right to make copies of the software for use on the system provided. Specific requirements of System Supplier's software license are subject to review and approval by City and Engineer.

2.7 INSTALLATION TEST EQUIPMENT

A. All necessary testing equipment for calibration and checking of system components shall be provided by System Supplier. System Supplier shall also furnish calibration and maintenance records for all testing and calibration equipment used on the site if requested by Engineer.

2.8 PROGRAMMING DEVICES

A. An instrument programming device shall be provided for the instruments specified in other sections. Quantity of programming devices shall be as specified in other sections.

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.

3.2 SYSTEM SOFTWARE CONFIGURATION

A. System software shall be configured by the System Supplier. Configuration services shall consist of the modification of the system database, report formats, operator interface graphic and tabular display screen formats, password and security implementation, and programming of control units to provide a fully functioning system. The System Supplier shall fully configure the system using data provided herein or supplied by the Engineer and/or the City after award of the contract.

B. Tuning of software programs shall be accomplished in such a manner that the program operates at its highest performance level. These programs include, but are not limited to Microsoft SQL Server, all PLC ladder logic, and others.

C. Control System Database

1. The control system database shall be modified 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 City. 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.

D. Graphic Screen Displays

1. The System Integrator shall be responsible for modifying the existing 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 with the SCADA System Software Standards and Conventions, which is attached as an appendix to this section. Alarm and/or event displays shall also be provided and proven functional prior to acceptance of the system.

2. All graphic screens shall use gray scale with colors to indicate the current state of the piece of equipment. The following graphic screens shall be modified, as a minimum.

a. Main Overview of OK Creek Station

b. Alarm Summary
c. Event Summary
d. Overview of each affected process area (with vectoring to sub-areas)

3. A minimum of 4 custom graphic displays shall be provided by the System Integrator.

E. Report Formats

1. Existing report formats shall be modified by the System Integrator using tag names defined in the database. 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 newly added plant variables (up to 4 variables) shall be provided. The report shall include hourly values and minimum/maximum/average values where appropriate. A minimum of 1 separate daily report shall be provided by the System Integrator.
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.

F. Configuration Review Meetings

1. Proposed graphic screens and report formats shall be reviewed with the City and Engineer throughout the configuration process. The System Integrator'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 City'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 Integrator 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 City.

3.3 SYSTEMS CHECK

A. System Integrator 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 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.

C. Field Calibration of Instruments

1. After each instrument has been installed, a technical representative of System Integrator 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.

D. Training for Installation Personnel

1. The field supervisor shall train the installation personnel in reading and understanding submittal drawings, and in the correct installation and wiring procedures for the equipment. 1 day shall be included for this training.

E. Field Inspection Prior to Start Up

1. After installation and wiring connections are complete, the field supervisor, with additional System Integrator'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 2 working days shall be included for this task, but System Integrator 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. System Check Out Report

a. The System Integrator shall submit a written report on the results of such tests to Engineer. Additional documentation shall be furnished as requested by Engineer to establish responsibility for corrective measures. System Integrator shall verify, in writing, to Engineer or City that System Integrator 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 Integrator shall supply a factory-trained engineer and 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. 2 working days shall be included for this task.

3.4 TESTING

A. The system shall be acceptance tested on site.

B. System Integrator shall prepare a testing procedure to be approved by City and 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 Integrator and witnessed by City and/or Engineer.

C. System Integrator shall notify Engineer and City 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 Integrator shall reimburse City and Engineer 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 Integrator'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 Integrator shall verify that all field signal changes are reflected in the proper address locations in the system database.

3. Site acceptance testing shall meet the following requirements:

   a. The site acceptance testing shall test the entire system, including all peripherals and associated software, under operating conditions. Both normal operating sequences and fault conditions shall be tested. All basic functions shall be demonstrated, including I/O processing, communications, alarm handling, HMI display functions, alarm logging, report generation, and historical data storage, as well as the specific functions listed herein.
   b. Operational testing shall operate continuously during 5 consecutive working days. During this period, the system shall operate continuously without faults for at least 72 hours. This operational test may run concurrently with the demonstration of hardware and software functions.
   c. The test procedure shall also include a minimum four-hour period for discretionary tests to be conducted by Engineer or City.
   d. The hardware test shall demonstrate proper operation of each hardware device and communications among devices and shall include verification of selected analog and discrete inputs and outputs.
   e. Software tests shall include running all diagnostics, debugging routines, and system test routines. The operating system, advanced process control language

compiler, and all associated drivers shall be fully tested and operable for the system test. Software "patches" or changes to bypass failed or flawed modules during the test will not be acceptable.

f. 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.

g. Any errors or abnormal occurrences shall be recorded by System Integrator's field representative. System Integrator'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.

h. 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. 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.

3.5 TRAINING

A. System Integrator shall conduct training courses for personnel selected by City. Training shall be provided in the categories below. Training shall be conducted by experienced instructors who are familiar with the specific system supplied.

B. General Training Requirements

1. In general, System Integrator's standard training courses may be used to meet the training objectives specified. Where standard courses do not meet these objectives, additional coursework shall be developed. Clock hour requirements for each level of training shall be as listed. A "clock hour" is defined as one hour of instruction or supervised training exercise. Training hour requirements are the number of hours of training to be provided for each student. Additional training time shall be provided if considered necessary to meet the training objectives.

2. Training Costs

a. All costs associated with the training program; excluding travel, lodging, and per diem expenses for City's and Engineer's personnel to attend off-site training programs; shall be the responsibility of System Integrator and shall be included in the contract price.

3. Lessons

a. Training lesson plans and other information for the second stage submittal as defined herein shall be submitted at least 30 days prior to the start of training.

4. Video Recording

    a. All training sessions shall be video recorded by the System Integrator for City's future use in training other personnel. Video recorded sessions shall be saved to DVD/R or Flash media for delivery to City. Pre-recorded videos of System Integrator's standard training programs may be substituted if they cover the same topics and are developed for the same versions of hardware and software. Furnishing videos of standard training programs shall not relieve System Integrator from any of the training requirements specified herein.

5. Instrument Training

    a. Training on the calibration, maintenance, troubleshooting, and repair for the instrument devices provided under this project shall be provided. Training shall also be provided for any hand-held or computer-based calibration devices and their associated software. 2 hours of training for 4 students shall be provided at the City's facility.

6. Supplemental Training

    a. System Integrator shall provide additional training to City's personnel on topics of City's choosing. Supplemental training shall be conducted in one session at City's facilities using the hardware and software installed for this project. The training shall consist of 4 hours of instruction for 4 students.

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

13500 APPENDIX A
SCADA System
Software Standards and Conventions

Initially Prepared by:

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Purpose

The main purpose of this document is to set standards which will assure uniformity of design concepts, formats, methodologies, procedures and quality of work for Human Machine Interface (HMI) SCADA, Operator Interface Terminal (OIT) local touch panel, and Programmable Logic Controller (PLC) programming. These standards will be implemented throughout the KCMO Wastewater SCADA Systems.

Programmers must review this document and adapt to these standards for design of the HMI, OIT and PLC programs for which they are responsible.

Hardware

The following table lists hardware that shall be used with the City Control System. The PLC Hardware shall be either Control Logix or Compact Logix by Allen Bradley as specified. The OIT's shall be PanelView by Allen Bradley.

Category	Hardware Description	Version
Control Logix CPU	1756-L82E	32.0-up
Control Logix Ethernet Module	1756-EN2T	
Control Logix Digital Input Module	1756-IA16I	
Control Logix Digital Output Module	1756-OA16I	
Control Logix Analog Input Module	1756-IF8I	
Control Logix Analog Output Module	1756-OF8	
Compact Logix CPU	1769-L33ER	32.0-up
Compact Logix Digital Input Module	1769-IA8I	
Compact Logix Digital Output Module	1769-OW8I	
Compact Logix Analog Input Module	1769-IF4I	
Compact Logix Analog Output Module	1769-OF8C	
Operator Interface Terminal (OIT)	PanelView Plus 7 Performance	11.0-up
HMI Servers	Stratus	
HMI Workstations	Thin Clients	

Table 1 - City Scada System Hardware

Software

The following table lists software and versions, as of the date of this document that shall be used with the City Scada System.

Category	Software Description	Version
Programmable Logic Controller (PLC)	RSLogix Studio 5000	32.0 or latest (with latest Patches)
Human Machine Interface (HMI)	FTView SE Distributed System	11.0 or latest (with latest Patches)
PanelView Operator Interface Terminal	FTView ME	11.0 or latest (with latest Patches)
Operating System for Site Control System Computers	Microsoft Server 2016 Standard	Latest
Operating System for Site Control System Computers	Microsoft Windows 10	Latest
Historical Server	Historian	6.0 or latest (with latest Patches)
SQL	SQL Standard	2016
Thin Manager	Thin Manager Software	11.0 or latest
PlantPax Library	Rockwell PlantPax Library	4.1

Table 2 - City Scada System Software

Redundancy

Plant Control System will use Stratus Servers with built in hardware redundancy and implement software to implement redundancy at the HMI level. Two HMI I/O (PASS) Virtual Machine servers will reside on the Host Server. Each server continuously communicates with the PLC's on the network. All other HMI's are considered "ThinClient View Nodes" and do not have the ability to communicate directly with the PLC's.

All ThinClient view nodes on the Control System network will communicate with one Thin Manager server (TM) I/O server for its data. If communications is lost with the primary Thin Manager I/O server, a view node will switch to the backup Thin Manager I/O server.

Networks

Ethernet

The Control System is based on an Ethernet network. The network consists of HMI's, OIT's, PLC's, switches, routers, computers, power monitors, VFDs, MCCs, and etc which will use the (TCP/IP for PCs) and (Ethernet/IP for everything else) protocol. Each device on an Ethernet network must have a unique identifier, known as an IP address. The list of IP address locations for devices is maintained by the City of KCMO Water Services – Wastewater Division, herein referred to as "Owner". If a Domain Controller (DC) is used, then that DC will assign the IP address per equipment's MAC address. (PCs only) When a DC is not used then a static IP address will be assigned. Require Layer 3 managed switches whenever radio communications are utilized. Layer 2 switches shall be used to develop VLANs to separate in-plant device communications and maintain healthy network traffic flows as needed. All access points to the network shall be physically lockable.

VLANs divide physical networks into smaller logical networks to increase performance, improve manageability, and simplify network design. VLANs are achieved through configuration of Ethernet switches. Each VLAN consists of a single broadcast domain that isolates traffic from other VLANs. Using VLANs limits the broadcast traffic, as well as allowing logical subnets to span multiple physical locations. There are two categories of VLANs:

 Static, often referred to as port-based, where switch ports are assigned to a VLAN so that it is transparent to the end user.

 Dynamic, where an end device negotiates VLAN characteristics with the switch or determines the VLAN based on the IP or hardware addresses.

Although more than one IP subnet may coexist on the same VLAN, the general recommendation is to use a one-to-one relationship between subnets and VLANs. This practice requires the use of a router or multi-layer switch to join multiple VLANs. Many routers and firewalls support tagged frames so that a single physical interface can be used to route between multiple logical networks. Properly segmented networks can also mitigate the risks of broadcast storms that may result from port scanning or worm activity.

When there are Ethernet Devices as a part of a sub-system, the PLC will have a second Ethernet card for a separate network for any Ethernet devices associated with that system (i.e. VFD's or power monitors).

All vendors will be assigned the IP addresses from Owner. These IP addresses are confidential and shall be treated as such.

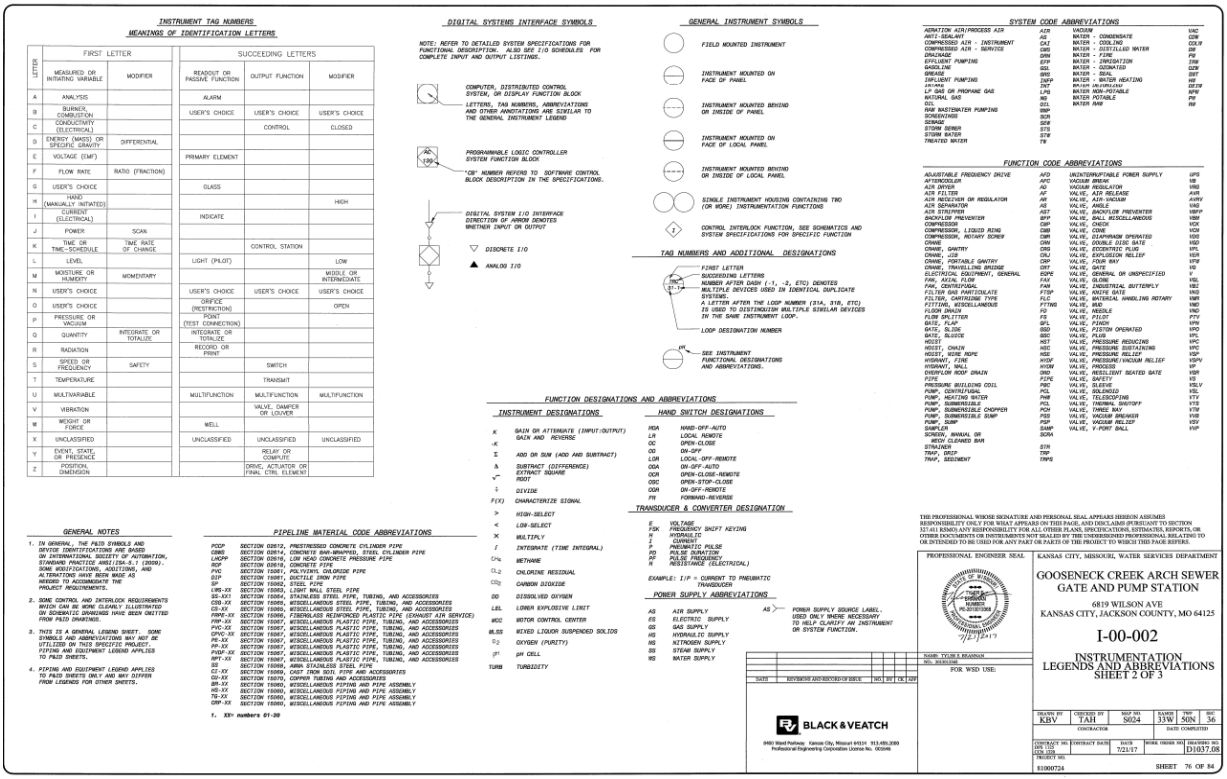
Name Conventions

Tag Name Conventions

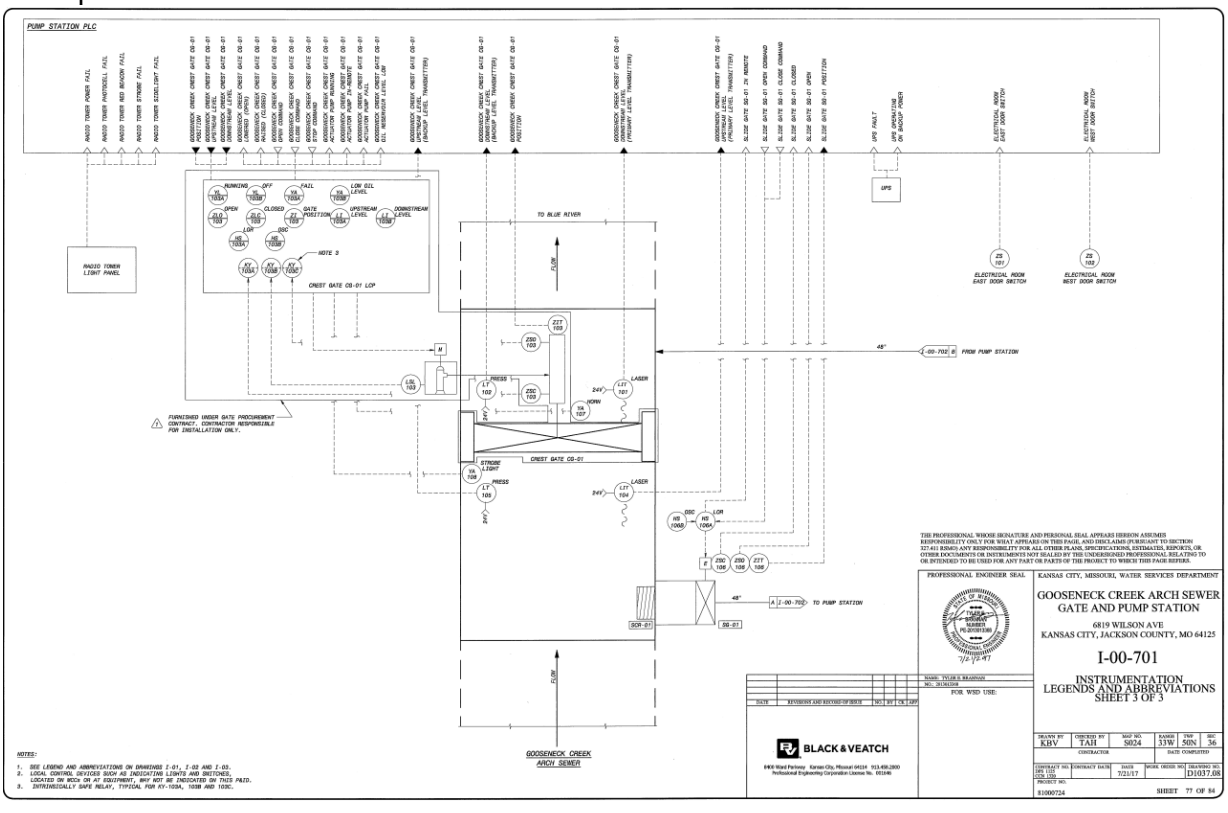
Databases exist for the ControlLogix PLC programming software, as for the following Direct Tag referencing will be used to save memory, FTView SE HMI software, the historical data systems (Microsoft SQL), and the FTView ME OIT. The databases shall use a common naming convention so that referencing values is similar for each application. The database entries are known as "Tags" and must have a unique name. It is the intent that the Equipment Type Code and Number in the SCADA Tag match the P&IDs of the facilities. If additional tag information is needed or P&IDs are not available, use the following naming in the tables below.

Default Naming

When a P&ID diagram is available, all tags shall be named based on the P&ID diagrams. See Examples below. This allows the tags to be traced back to the existing equipment using the diagrams already at hand. Before generating your own tag names, always ensure that a P&ID is not available first. The P&ID naming conventions vary depending on the Engineering Firms standards.
Example P&ID Chart/Abbreviations


INSTRUMENT TAG NUMBERS
MEANINGS OF IDENTIFICATION LETTERS
DIGITAL SYSTEMS INTERFACE SYMBOLS
GENERAL INSTRUMENT SYMBOLS
SYSTEM CODE ABBREVIATIONS
FUNCTION CODE ABBREVIATIONS
TAG NUMBERS AND ADDITIONAL DESIGNATIONS
FUNCTION DESIGNATIONS AND ABBREVIATIONS
INSTRUMENT DESIGNATIONS
HAND SWITCH DESIGNATIONS
TRANSDUCER & CONVERTER DESIGNATION
POWER SUPPLY ABBREVIATIONS
GENERAL NOTES
PIPELINE MATERIAL CODE ABBREVIATIONS
PROFESSIONAL ENGINEER SEAL
KANSAS CITY, MISSOURI, WATER SERVICES DEPARTMENT
GOOSENECK CREEK ARCH SEWER
GATE AND PUMP STATION
6819 WILSON AVE
KANSAS CITY, JACKSON COUNTY, MO 64125
I-00-002
INSTRUMENTATION
LEGENDS AND ABBREVIATIONS
SHEET 2 OF 3
BLACK & VEATCH
FOR WSD USE:
81000724
SHEET 76 OF 84

Example P&ID


PUMP STATION PLC
RADIO TOWER LIGHT PANEL
ONEBT GATE CG-01 LOP
TO BLUE RIVER
FLOW
CREST GATE CG-01
FURNISHED UNDER GATE PROCUREMENT CONTRACT. CONTRACTOR RESPONSIBLE FOR INSTALLATION ONLY.
FROM PUMP STATION
TO PUMP STATION
ELECTRICAL ROOM EAST DOOR SWITCH
ELECTRICAL ROOM WEST DOOR SWITCH
UPS
GOOSENECK CREEK ARCH SEWER
PROFESSIONAL ENGINEER SEAL
KANSAS CITY, MISSOURI, WATER SERVICES DEPARTMENT
GOOSENECK CREEK ARCH SEWER
GATE AND PUMP STATION
6819 WILSON AVE
KANSAS CITY, JACKSON COUNTY, MO 64125
I-00-701
INSTRUMENTATION
LEGENDS AND ABBREVIATIONS
SHEET 3 OF 3
BLACK & VEATCH
FOR WSD USE:
81000724
SHEET 77 OF 84

Alternate Naming: ISA Standards

When a P&ID is not available, or it fails to cover a few points that exist (such as internal panel equipment failures for example) Tag names shall be given based upon the ANSI/ISA 5.1 Standard. The table below is the “general” form of the standard, and a more detailed explanation follows.

Meanings of Identification Letters

Table 4.1 — Identification letters

Note: Numbers in parentheses refer to the preceding explanatory notes in Clause 4.2.

	First letters (1)		Succeeding letters (15)		
	Column 1	Column 2	Column 3	Column 4	Column 5
	Measured/Initiating Variable	Variable Modifier (10)	Readout/Passive Function	Output/Active Function	Function Modifier
A	Analysis (2)(3)(4)		Alarm		
B	Burner, Combustion (2)		User's Choice (5)	User's Choice (5)	User's Choice (5)
C	User's Choice (3a)(5)			Control (23a)(23e)	Close (27b)
D	User's Choice (3a)(5)	Difference, Differential, (11a)(12a)			Deviation (28)
E	Voltage (2)		Sensor, Primary Element		
F	Flow, Flow Rate (2)	Ratio (12b)			
G	User's Choice		Glass, Gauge, Viewing Device (16)		
H	Hand (2)				High (27a)(28a)(29)
I	Current (2)		Indicate (17)		
J	Power (2)		Scan (18)		
K	Time, Schedule (2)	Time Rate of Change (12c)(13)		Control Station (24)	
L	Level (2)		Light (19)		Low (27b)(28)(29)
M	User's Choice (3a)(5)				Middle, Intermediate (27c)(28) (29)
N	User's Choice (5)		User's Choice (5)	User's Choice (5)	User's Choice (5)
O	User's Choice (5)		Orifice, Restriction		Open (27a)
P	Pressure (2)		Point (Test Connection)		
Q	Quantity (2)	Integrate, Totalize (11b)	Integrate, Totalize		
R	Radiation (2)		Record (20)		Run
S	Speed, Frequency (2)	Safety(14)		Switch (23b)	Stop
T	Temperature (2)			Transmit	
U	Multivariable (2)(6)		Multifunction (21)	Multifunction (21)	
V	Vibration, Mechanical Analysis (2)(4)(7)			Valve, Damper, Louver (23c)(23e)	
W	Weight, Force (2)		Well, Probe		
X	Unclassified (8)	X-axis (11c)	Accessory Devices (22), Unclassified (8)	Unclassified (8)	Unclassified (8)
Y	Event, State, Presence (2)(9)	Y-axis (11c)		Auxiliary Devices (23d)(25)(26)	
Z	Position, Dimension (2)	Z-axis (11c), Safety Instrumented System (30)		Driver, Actuator, Unclassified final control element	

Step 1:

Assign each IO point a 3-digit number. When multiple IO points service the same piece of equipment (such as a Pump's start/stop/speed/fail) each point will share the same number as the "master" it serves. These numbers are broken up as follows:

First Digit:	Second Digit:	Third Digit:
A general "Area" within the PLC's scope of control. The order shall be ascending, in the general process flow of the system. For example, you may have: Influent Pump = 0 RAS = 1 WAS = 2 Wetwell #1 = 3 Wetwell #2 = 4 Other areas = 5	The second digit is the general device type within the PLC' scope of control. The lowest numbers should be the biggest, most important equipment (such as pumps for example) Pumps = 0 Grinders = 1 Valves = 2 Analog transmitters = 3	The third digit is for identifying multiple instances of the same type of device in the same area. An example is shown below: Wetwell #1 Pump #1 = 301 Wetwell #1 Pump #2 = 302 Wetwell #2 Analog Level #1 = 431 Wetwell #2 Analog Level #2 = 432

Step 2:

Assign the correct letter prefix to each IO point. This is based purely on the ANSI/ISA Table 4.1, but for quick reference here is a list of prefixes that are commonly used for Water/Wastewater applications.

Digital Inputs		Reset	low-low	low	med	high	high-high
Level Switch	LS	LSLLR	LSLL	LSL	LSM	LSH	LSHH
Pressure Switch	PS			PSL	PSM	PSH	
Fail/alarm	YA		YALL	YAL		YAH	YAHH
Flow Indicate	FI			FIL	FIM	FIH	
Level Indicate	LI			LIL	LIM	LIH	
Pressure indicates	PI			PIL	PIM	PIH	
Current Indicate	II			IIL	IIM	IIH	
Voltage Indicate	EI			EIL	EIM	EIH	
Temperature Indicate	TI			TIL	TIM	TIH	
Density Indicate	DI			DIL	DIM	DIH	
Speed Indicate	SI			SIL	SIM	SIH	
Remote Output CMD	YX						
Event Light	YL						
Event Indicate	YI						
Hand Switch	HS						
Valve Position	ZS						
Valve Closed FB	ZSC						
Valve Open FB	ZSO						

Valve Center FB	ZSM
Valve Moving/traveling	ZSX

Digital Outputs	
General Output CMD	YC
Motor Run CMD	MR
Valve Open CMD	XVO
Valve Close CMD	XVC
Valve Middle CMD	XVM

Analog Inputs	
Valve Position	ZIT
Pressure value	PIT
Current Value	IIT
Voltage Value	EIT
Temperature Value	TIT
Flow Value	FIT
Level Value	LIT
Density Value	DIT
Speed Value	SIT
Torque Value	MIT

Analog Outputs	
Valve SP	ZIC
Pressure SP	PIC
Current SP	IIC
Voltage SP	EIC
Temperature SP	TIC
Flow SP	FIC
Level SP	LIC
Speed SP	SIC
Torque SP	MIC

Step 3:

Once the prefix and number are assigned, digital values get a suffix that gives more specific information about the exact function of the bit. These suffixes are tied to the prefixes, so a “1A” suffix with a “HS” prefix means something completely different than with a “YA” prefix. See the below tables.

IO Code	Modifier	Modifier Translation
HS	1A	Auto/Remote
	1A1	(Sec) Auto/Remote
	1B	Hand/Local
	1B1	(Sec) Hand/Local
	1C	Off
	2A	Start
	2B	Stop
	2C	Emergency
	3A	Fwd
	3B	Rev
	4A	Jog Fwd
	4B	Jog Rev
	5A	reset
	5B	silence

IO Code	Modifier	Modifier Translation
YA	0 (A-B-C)	UNDEFINED: SPECIFIC INSTANCES
	1A	General Fail/Fault
	1B	Overload
	1C	Temp
	1D	Vibration
	1E	Seal
	1F	Trip
	2A/B/C	Misalignment
	1G	High Overtorque
	1G1	Hi Hi Overtorque
	1H	Filter Blocked
	1I	Obstruction
	1J	Shear Pin Fail

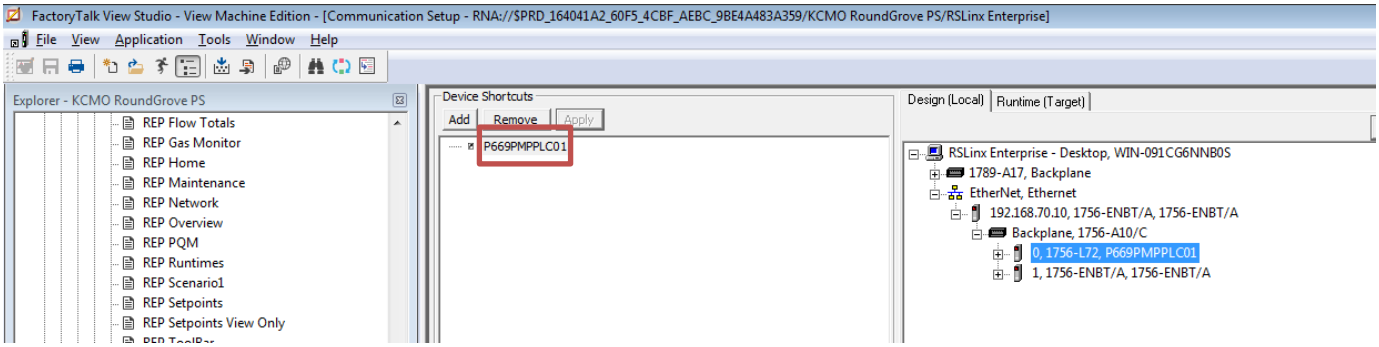
	6A	Hi Speed
	6B	Low Speed
	7A	Bypass

IO Code	Modifier	Modifier Translation
MR,YC,YX,ZS	0 (A-B-C)	ALM OR OTHER UNDEFINED INSTANCES
YI, YL	1A	On
	1B	Off
	2A	Start/Run (FWD)
	2B	Start/Run (REV)
	3A	Stop (FWD)
	3B	Stop (REV)
	4A	Open
	4B	Close
	5A	In Auto/Remote
	5B	In Hand/Local
	5C	In Off
	6A	High
	6B	Low
	7A	OK/Normal
	7B	NOT OK/Emergency
	7C	Bypassed
	8A	NORTH
	8B	SOUTH
	8C	EAST
	8D	WEST
	8E	OTHER (BETWEEN 2 STATES OR TRANSIT)
	9A	EXTENDED
	9B	RETRACTED

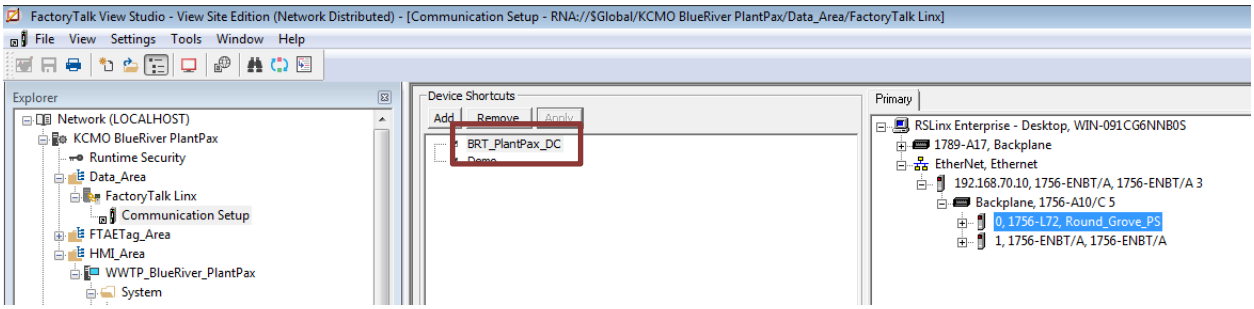
Meanings of Identification Numbers

PlantPax Tag Names with Shortcuts

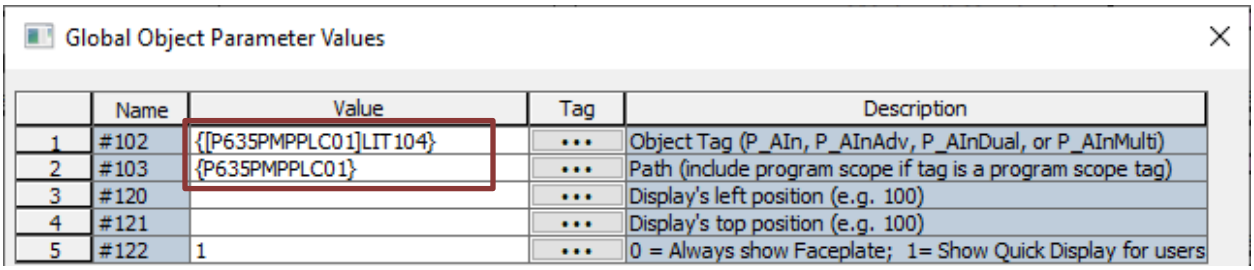
Shortcuts are used in the OIT/HMI to establish a path from the HMI to the PLC.
FTView ME version for an OIT



FTView SE version for an HMI



Both OIT/HMI Shortcut and PlantPax Tag example. {[P635PMPPLC01]LIT104}



PlantPax Tag Name Examples

shortcut	PlantPax Names	PLC tag Description
P701PRIPLCCP01	HS131_1A	Moyno 1 HOA in Auto
P701PRIPLCCP01	YA101_1B	Moyno Pump 1 Overload
P701PRIPLCCP01	YI101_2A	Moyno 1 Pump Running
P701PRIPLCCP01	YA101_1E	Moyno 1 Seal Water OK
P701PRIPLCCP01	YI111_2A	Moyno 1 Grinder Running Forward
P701PRIPLCCP01	YI111_2B	Moyno 1 Grinder Running Reverse
P701PRIPLCCP01	YA111_1B	Moyno 1 Grinder Overload
P701PRIPLCCP01	HS231_1A	Moyno 2 HOA in Auto
P701PRIPLCCP01	YA201_1B	Moyno Pump 2 Overload
P701PRIPLCCP01	YI201_2A	Moyno 2 Pump Running
P701PRIPLCCP01	YA201_1E	Moyno 2 Seal Water OK
P701PRIPLCCP01	YI211_2A	Moyno 2 Grinder Running Forward
P701PRIPLCCP01	YI211_2B	Moyno 2 Grinder Running Reverse
P701PRIPLCCP01	YA211_1B	Grinder #2 Overload
P701PRIPLCCP01	HS331_1A	Moyno 3 HOA in Auto
P701PRIPLCCP01	YA301_1B	Moyno Pump 3 Overload
P701PRIPLCCP01	YI301_2A	Moyno 3 Pump Running
P701PRIPLCCP01	YA301_1E	Moyno 3 Seal Water OK
P701PRIPLCCP01	YI311_2A	Moyno 3 Grinder Running Forward
P701PRIPLCCP01	YI311_2B	Moyno 3 Grinder Running Reverse
P701PRIPLCCP01	YA311_1B	Grinder #3 Overload
P701PRIPLCCP01	HS431_1A	Moyno 4 HOA in Auto
P701PRIPLCCP01	YA401_1B	Moyno Pump 4 Overload
P701PRIPLCCP01	YI401_2A	Moyno 4 Pump Running

P701PRIPLCCP01	YA401_1E	Moyno 4 Seal Water OK
P701PRIPLCCP01	YI411_2A	Moyno 4 Grinder Running Forward
P701PRIPLCCP01	YI411_2B	Moyno 4 Grinder Running Reverse
P701PRIPLCCP01	YA411_1B	Grinder 4 Overload
P701PRIPLCCP01	YA531_1H	Basement Flood Detection
P701PRIPLCCP01	YI501_1A	Sump Pump Running
P701PRIPLCCP01	YA031_1A	3 Phase Power Loss
P701PRIPLCCP01	YA531_1H	Basement Flood Detection
P701PRIPLCCP01	YI501_1A	Sump Pump Running
P701PRIPLCCP01	YI501_1A	Sump Pump Running
P701PRIPLCCP01	MR101_2A	Moyno Pump 1 Start
P701PRIPLCCP01	YC101_7A	Pump 1 Pressure Interlock OK
P701PRIPLCCP01	MR111_2A	Moyno Grinder 1 Run Forward
P701PRIPLCCP01	MR111_2B	Moyno Grinder 1 Run Reverse
P701PRIPLCCP01	MR201_2A	Moyno Pump 2 Start
P701PRIPLCCP01	YC201_7A	Pump 2 Pressure Interlock OK
P701PRIPLCCP01	MR211_2A	Moyno Grinder 2 Run Forward
P701PRIPLCCP01	MR211_2B	Moyno Grinder 2 Run Reverse
P701PRIPLCCP01	MR103_2A	Moyno Pump3 Start
P701PRIPLCCP01	MR311_2A	Moyno Grinder 3 Run Forward
P701PRIPLCCP01	MR311_2A	Moyno Grinder 3 Run Forward
P701PRIPLCCP01	MR311_2B	Moyno 3 Grinder Reverse
P701PRIPLCCP01	MR401_2A	Moyno Pump 4 Run
P701PRIPLCCP01	MR411_2B	Moyno Grinder 4 Run Reverse
P701PRIPLCCP01	MR411_2A	Moyno Grinder 4 Run Forward
P701PRIPLCCP01	MR411_2B	Moyno Grinder 4 Run Reverse
P701PRIPLCCP01	YC531_0A	Basement Flood Alarm
P701PRIPLCCP01	IIT111	Moyno 1 Grinder Current
P701PRIPLCCP01	IIT101	Moyno 1 Pump Current
P701PRIPLCCP01	IIT211	Moyno 2 Grinder Current
P701PRIPLCCP01	IIT201	Moyno 2 Pump Current
P701PRIPLCCP01	IIT311	Moyno 3 Grinder Current
P701PRIPLCCP01	IIT301	Moyno 3 Pump Current
P701PRIPLCCP01	IIT411	Moyno 4 Grinder Current
P701PRIPLCCP01	PIT101	Moyno 1 Pump Discharge Pressure
P701PRIPLCCP01	PIT201	Moyno 2 Pump Discharge Pressure
P701PRIPLCCP01	PIT301	Moyno 3 Pump Discharge Pressure
P701PRIPLCCP01	PIT401	Moyno 4 Pump Discharge Pressure

Table 3 - Tag Name Codes

"Note: That in the examples in Table 3 "P701" refers to the facility ID. Facility IDs are identified in the "Non PlantPax Tags" section"

PlantPax Tag Name Examples if P&IDs are not available

Analog Input

LIT- Wetwell Level Indication	
AOI P_AIn	**LIT101**
AOI P_AIChan	**LIT101_Chan (needed for HMI/OIT faceplate)**

Table 4 – PlantPax Analog Input Example Tag Names

Constant Speed Motor

Pump 1	
AOI P_Motor	**MT101**
AOI P_Intlk	**MT101_Intlk (needed for HMI/OIT faceplate)**
AOI P_Perm	**MT101_Perm (needed for HMI/OIT faceplate)**
AOI P_ResInh	**MT101_ResInh (needed for HMI/OIT faceplate)**
AOI P_Motor	**MT101_Ovld (needed for HMI/OIT faceplate)**
AOI P_RunTime	**MT101_RunTime (needed for HMI/OIT faceplate)**

Table 5 – PlantPax Constant Speed Motor Example Tag Names

VFD

Pump 1	
AOI P_VSD	**MT101**
AOI P_Intlk	**MT101_Intlk (needed for HMI/OIT faceplate)**
AOI P_Perm	**MT101_Perm (needed for HMI/OIT faceplate)**
AOI P_ResInh	**MT101_ResInh (needed for HMI/OIT faceplate)**
AOI P_VSD	**MT101_Ovld (needed for HMI/OIT faceplate)**
AOI P_RunTime	**MT101_RunTime (needed for HMI/OIT faceplate)**

Table 6 – PlantPax VFD Example Tag Names

Hand Operated Motor

Pump 1	
AOI P_MotorHO	**MT101**
AOI P_Intlk	**MT101_Intlk (needed for HMI/OIT faceplate)**
AOI P_Perm	**MT101_Perm (needed for HMI/OIT faceplate)**
AOI P_ResInh	**MT101_ResInh (needed for HMI/OIT faceplate)**
AOI P_MotorHO	**MT101_Ovld (needed for HMI/OIT faceplate)**

AOI P_RunTime	**MT101_RunTime (needed for HMI/OIT faceplate)**

Table 7 – PlantPax Hand Operated Motor Example Tag Names

Open/Close Valves

Slide Gate 1	
AOI P_ValveMO	**XV101**
AOI P_Intlk	**XV101_Intlk (needed for HMI/OIT faceplate)**
AOI P_Perm	**XV101_OpenPerm (needed for HMI/OIT faceplate)**
AOI P_Perm	**XV101_ClosePerm (needed for HMI/OIT faceplate)**
AOI P_ValveStats	**XV101_ValveStats (needed for HMI/OIT faceplate)**

Table 8- PlantPax Open/Close Valve Example Tag Names

Variable Position Valve

Control Valve 1	
AOI P_ValveC	**XV101**
AOI P_AIn	**ZIT101**
AOI P_Intlk	**XV101_Intlk (needed for HMI/OIT faceplate)**
AOI P_Perm	**XV101_Perm (needed for HMI/OIT faceplate)**

Table 9 – PlantPax Variable Position Valve Example Tag Names

Digital Inputs

Various Inputs	
AOI P_DIn	**LSHH (Level Switch High High)**
AOI P_DIn	**LSLL (Level Switch Low Low)**
AOI P_DIn	**LSHH_201 (Level Switch Sump High)**
AOI P_DIn	**YA101_1A (3Phase Loss)**
AOI P_DIn	**HS101_1A (HOA Switch in Auto)**

Table 10 – PlantPax Digital Inputs Example Tag Names

Non PlantPax Tags

Description of a “Non PlantPax Tag”, any tag that is an Internal Program Tag in the PLC not a PlantPax Controller tag for Global Objects.
In the Studio 5000 software, a tag must not be over maximum of 30 characters and be all capital letters. Even though a tag can be longer in the other databases, all database tags shall be maximum of 30 characters.

For non PlantPax tag name standard is:

PPPP_EEENNNN_SSSSSSSSSSSSS_FF (30 Characters Maximum)

Where:

PPPP_ = Facility/Plant Code (4 or 5 Characters from table below)
EEE = Equipment Type Code (3 Characters Minimum as shown in Table 2)
NNNN_ = Equipment Number (4 Characters Minimum as shown in Table 2)
SSSSSSSSSSSSS_ = Signal (15 or more Characters)
FF = Function Code (2 Characters Minimum)
On facilities that do not have P&ID for naming, a 3 or 5 character prefix (up to 4 letters/Numbers and an underscore) will be used on all tags. The prefix will identify the location of the Control System location. Use the table below to identify the location.

The Equipment Description (EEE) and associated codes for different types of assets used at a WWTP .

Example: P710_PMP1_RUNNING

Tag Plant Name Codes

PPPP-Plant	Code
Blue River WWTP Primary Treatment	P701
Blue River Secondary WWTP	P702
Blue River Chemical Storage	P703
Blue River WWTP Primary Solids	P710
Birmingham WWTP	P711
Westside WWTP	P712
Westside WWTP Disinfection	P713
Todd Creek WWTP	P715
Rockybranch WWTP	P718
Fishing River WWTP	P720
KCI De-Icing	P745

PPPP-Facility	Code
South West Blvd FS	P600
25th St Flood Pump Station (FS)	P601
North Air FS	P604
Gillis FS	P606
Lydia FS	P607
Prospect FS	P608
Milwaukee FS	P609
Truman FS	P610
Hawthorne FS	P611
Blue Banks FS	P612

South Air FS	P614
Santa Fe PS	P617
Swope Industrial PS	P618
North Church PS	P619
Blue River Sec Effluent PS	P620
Pied Creek PS	P623
Second Creek PS	P628
First Creek PS	P627
Gooseneck PS	P635
South Air Relief Well PS	P637
Wild Wood West PS	P642
KCI Industrial PS	P643
Briarcliff West PS	P646
15th & Crystal PS	P647
Line Creek PS	P648
Riverside PS	P649
Blue River PS	P651
Buckeye PS	P652
North Land Mobile PS	P657
NEID PS	P658
Chouteau Trwy PS	P659
Turkey Creek PS	P661
Riverside Horizons PS	P662
Birchwood PS	P663
12th St PS	P667
Round Grove PS	P669
Trolley Trail Basin (DS-68)	P674
South Air PS	P676
118th and Lawndale	P677
87th St PS	P678
Lake Waukomis PS	P682
White Aloe PS	P684
Brush Creek PS	P686
Upper Rush PS	P687
Harlem PS	P688
Burlington Creek PS	P691
83rd and Blue PS	P692
Birmingham PS	P693
Mace Rd PS	P694
Weatherby Lake PS	P696
Platte Woods PS	P697
Kemper FS	P699

Table 1 - Tag Name Plant Codes

Tag Equipment Type Codes

EEE-Equipment	Code
ACTUATOR	ACTU
AERATOR	AER
AIR COMPRESSOR	AIRC
BAR SCREEN	BS
BASIN	BAS
BATTERY BANK	BB
BATTERY CHARGER	BBC
BELT PRESS	BELTPR
BLOWER	BLOW
BUILDING	BLDG
CAMERAS/SECURITY/MONITOR	CAMSEC
CHEMICAL FEED	CHMF
CHEMICAL SILO/STORAGE	CSILO
CHEMICAL UNLOADING	CHMUN
CLARIFIER	CLAR
CLARIFIER MECHANISM	CLARM
COMMUNICATION	COMM
COMPUTER/SYSTEM	CMP
CONTAINMENT CHEM OR OILS	CONT
CONVEYOR	CONV
CRANE	CRN
DEHUMIDIFIER/AIR DRYER	DHAD
DIFFUSERS	DIF
DIGESTOR	DGST
DISTRIBUTION (Wiring etc)	DIST
EDDY CURRENT DRIVES	EDCD
ELEVATOR	ELEV
FILTER	FILT
FLOCCULATOR	FLOC
GATE-PROCESS	GATE
GENERATOR	GEN
GRIT REMOVAL EQUIPMENT	GRIT
GROUNDS	GRND
HOIST	HOIST
HVAC-Conveyance	HVACN
HVAC-Heating and cooling	HVAC
LABORATORY EQUIPMENT	LAB
LIGHTING	LIGHT
MACHINERY/TOOLS-FIXED	MACHFX
MANHOLE STRUCTURE	MH
MIXER	MIX

MONO RAIL	MRAIL
MOTOR	MTR
MOTOR (NON ELECTRICAL)	MTRNE
MOTOR CONTROL CENTER	MCC
OPERATOR INTERFACE TERMINAL/FIELD CONTROLS	OIT
OVERHEAD DOORS (TRUCKBAY)	OHD
PIPING-ABOVEGROUND	PIPAB
PIPING-SITE/CHANNELS	PIPCH
PLUMBING (non-process)	PLBG
PORTABLE/MOBILE EQUIPMENT	PORTEQ
PROGRAMMABLE LOGIC CONTROLLER	PLC
PUMP	PMP
PUMPS-MOBILE	PMPMB
PUMPING UNIT	PUNIT
ROOF	ROOF
SAFETY-LIFE	SAFE
SAMPLER	SAMPLE
SCALE SENSOR	SCALE
SCRUBBER-AIR	SCRAIR
SEAL WATER SYSTE	SWS
SECURITY ALARM	SEC
SENSOR/METERS	SENS
SLG COLLECTOR/SWEEP ASSEMBLY	SLGCOL
SOFT START	S
SUB STATIONS ELECTRICAL	SUBST
SWITCHGEAR	SG
TANK	TANK
TOOLS-POWER HAND	TOOLPW
TRANSFORMER	TRAN
TRICKLING FILTER	TFIL
TRICKLING FILTER DISTRIB ASSEM	TFILAR
ULTRAVIOLET EQUIPMENT	UV
UNINTERRUPTABLE POWER SUPPLY	UPS
VALVE	VLV
VERIABLE FREQUENCY DRIVE	VFD
VIBRATOR	VIBRAT
WATER ELEVATED TANK	WILTNK
WATER RESERVOIR	WRES

Table 2 - Tag Name Equipment Type Codes

Tag Function Codes

FF - Function	Code
Timer	TMR
Alarm	AL
Setpoint	SP
Feedback	FB
Fault	FLT
Available	AVE
Call	CALL
Runtime	RT
Command	CMD

Table 3 - Tag Function Codes

Other Abbreviations

ABV-Abbreviations	Code
Alarm	ALM
Auto	A
Add On Instruction	AOI
Add On Profile	AOP
Variable Frequency Drive	VFD
Closed	CLSD
Close	CLS
Command	CMD
Effluent	EFF
Failure	FAIL
Fail To Run	FTR
Fail To Stop	FTS
Fail To Open	FTO
Fail To Close	FTC
Gallons Per Minute	GPM
Hand	H
Influent	INF
Lagoon	LGN
Level	LVL
Manual	M
Millions of Gallons Per Day	MGD

Off	O
Open	OPN
Parts Per Million	PPM
Position	POS
Pressure	PSI
Programmable Logic Controller	PLC
Pump	PMP
Raw I/O Signals	RAW
Remote Terminal Unit	RTU
Reset	RST
Required	RQD
Running	RUNNING
Scaled I/O Signals	SCL
Speed	SPD
Temperature	TMP
Timer	TMR
Torque High	TQH
Torque High High	TQHH
Total	TTL
Warning	WARN

Table 4 – Other Abbreviations

Security

HMI

HMI security is provided at the Domain level – Domain level through Microsoft Active Directory. The Active Directory and Domain is separate from the KCMO Water Services Domain.

The first level of security is at the operating system level and will be in accordance with the KCMO Wastewater computer security requirements.

HMI user names and passwords are required that define user privileges maintained in the Active Directory. Each HMI user will have a unique password which will be maintained by the KCMO Wastewater department or preferred qualified Admin. Each user will be assigned to one of the following security groups. The following user groups and associated privileges will be used:

Security Group	Security Area	Application Feature	Privileges Groups A-G	Typical nonuse Auto Logoff Time
Administrator	Area01_Basic Area01_Advanced	View Only	G	30 Minutes

Engineering	Area01_Basic Area01_Advanced	AlarmAck/ AlarmConfig/ AlarmDisable/ AlarmShelve/ BypassFeedback/ BypassInterlocks/ CmdSrcMaint/ CmdSrcOperProg/ CmdSrcOutOfService/ ConfigSecurity/ DeviceConfigBehavior/ DeviceConfigDiagnostics/ DeviceConfigFailTimers/ DeviceConfigHMI/ DeviceConfigLimits/ DeviceConfigThresholds/ DeviceConfigTimers/ DeviceConfigTuning/ EnableSimulation/ EnterOperSettings/ OperateEquipment/ OverrideInputs/ OverrideOutputs/ ProcedureAdvancedExceptions/ ProcedureChangeParameters/ ProceduresChangeSetpoints/ ProcedureControl/ ProcedureEquipmentControl/ ProcedureExceptions/ ProcedureForceSequence/ ProcedureManualControl/ ResetAccumulators/ RespondToPrompts/ ShowFaceplates.	E	30 Minutes
Maintenance	Area01_Basic Area01_Advanced	AlarmAck/ AlarmDisable/ AlarmShelve/ BypassFeedback/ BypassInterlocks/ CmdSrcMaint/ CmdSrcOperProg/ CmdSrcOutOfService/ DeviceConfigDiagnostics/ DeviceConfigThresholds/ EnterOperSettings/ OperateEquipment/	C	30 Minutes

		OverrideInputs/ OverrideOutputs/ ProcedureAdvancedExceptions/ ProcedureChangeParameters/ ProceduresChangeSetpoints/ ProcedureControl/ ProcedureEquipmentControl/ ProcedureExceptions/ ProcedureForceSequence/ ProcedureManualControl/ ResetAccumulators/ RespondToPrompts/ ShowFaceplates.		
Maintenance Supervisor	Area01_Basic Area01_Advanced	AlarmAck/ AlarmDisable/ AlarmShelve/ BypassFeedback/ BypassInterlocks/ CmdSrcMaint/ CmdSrcOperProg/ CmdSrcOutOfService/ DeviceConfigDiagnostics/ DeviceConfigFailTimers/ DeviceConfigLimits/ DeviceConfigThresholds/ DeviceConfigTimers/ DeviceConfigTuning EnterOperSettings/ OperateEquipment/ OverrideInputs/ OverrideOutputs/ ProcedureAdvancedExceptions/ ProcedureChangeParameters/ ProceduresChangeSetpoints/ ProcedureControl/ ProcedureEquipmentControl/ ProcedureExceptions/ ProcedureForceSequence/ ProcedureManualControl/ ResetAccumulators/ RespondToPrompts/ ShowFaceplates.	D	30 Minutes
Manager	Area01_Basic Area01_Advanced	AlarmAck/ AlarmDisable/ AlarmShelve/ BypassInterlocks/	F	30 Minutes

		CmdSrcOperProg/ DeviceConfigThresholds/ EnterOperSettings/ OperateEquipment/ ProcedureAdvancedExceptions/ ProcedureChangeParameters/ ProceduresChangeSetpoints/ ProcedureControl/ ProcedureEquipmentControl/ ProcedureExceptions/ ProcedureForceSequence/ ProcedureManualControl/ RespondToPrompts/		
Operating Supervisor	Area01_Basic Area01_Advanced	AlarmAck/ AlarmDisable/ AlarmShelve/ BypassInterlocks/ CmdSrcOperProg/ DeviceConfigThresholds/ EnterOperSettings/ OperateEquipment/ ProcedureAdvancedExceptions/ ProcedureChangeParameters/ ProceduresChangeSetpoints/ ProcedureControl/ ProcedureEquipmentControl/ ProcedureExceptions/ ProcedureForceSequence/ ProcedureManualControl/ RespondToPrompts/	B	30 Minutes
Operators	Area01_Basic Area01_Advanced	AlarmAck/ AlarmShelve/ EnterOperSettings/ OperateEquipment/ ProcedureControl/ ProcedureExceptions/ ProcedureManualControl/ RespondToPrompts/	A	30 Minutes

Table 14 - PlantPax HMI Security Configuration

OIT

OIT security is provided at two levels – (Local Access and Windows Users/Active Directory from respective Domain Controller (DC) Server)
Local access is to the OIT level through OIT Login. Typical (User Name: admin) (Password: Facility Number) Each OIT will have the same user security groups as each other and as the HMI.
KCMO will have one DC for the entire system. All other sites will access that DC and its active directory. If a site loses communication or is not directly connected to the network, it will continue to run via onsite with a back up DC using last connected information. If local edits are made at the back up DC, they will be received by the central DC when reconnected.

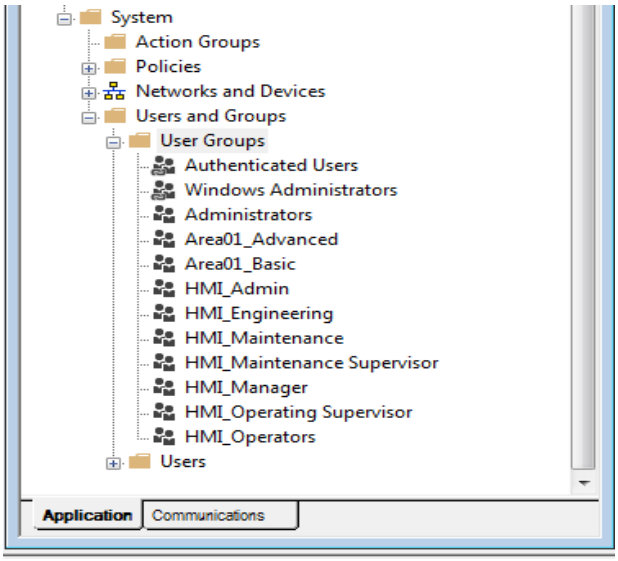


Figure 1 – User Groups

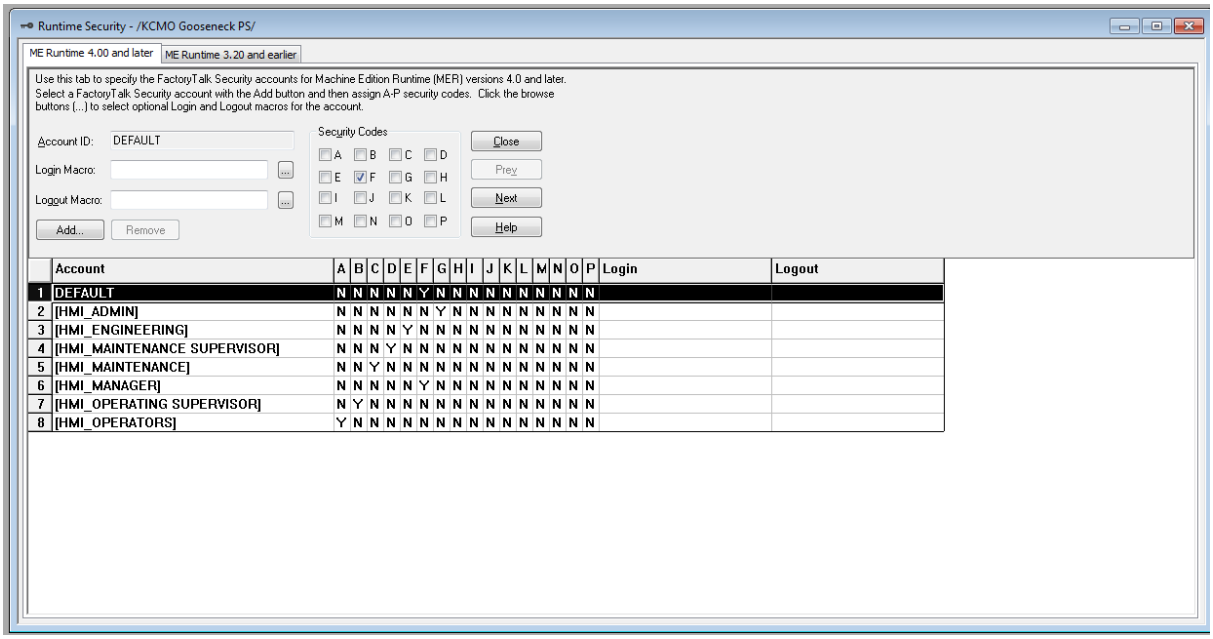


Figure 2 – Runtime Security

Application/Display Names

HMI

Application Name in FactoryTalk View Studio – View Site Edition that contains configuration information for the Application System Settings, Graphics Displays, Alarm Setup, Communication Setup, System Policies, Networks and Devices, Users, and Groups. Using standard names will ensure that the files are organized.

Application Name

HMI Application name standards. Using standard names will ensure that the files will be organized.
The application name can be up to 32 characters long, and must be unique to the application. The application file is given the extension .sed. Applications will be Archived using the Rockwell Software Factory Talk View SE Application Manager "Backup application" program. This Archive will be named the same as the Application with a .apb extension.
The HMI names for KCMO Wastewater will need to adhere to a 11 character limit. The HMI name will begin with the customer code "KCW-P" and "PPP" (Name of the Facility)

Examples:
KCW-PPP
KCW-P710
KCW-P720
KCW-P712
KCW-P718
KCW-P715

Main Process Screens
Each file name will begin with a prefix of the Integrator code III_ proceeded by Site Name code PPP_. The file will then contain a descriptive filename for the area it depicts.
Definition of an Integrator Code would be the name of the company in three digits.
Code III example (R.E. Pedrotti Company - REP)

Examples:

III_PPP_Home (REP_BRT_Home)	Site Home Screen (Level 1)
III_PPP_Overview (REP_BRT_Overview)	Site Overview (Level 2)
III_Alarm_Summary (REP_Alarm_Summary)	Alarm Summary
III_PPP_Cent_Home (REP_BRT_Cent_Home)	Centrifuge Home Screen (Level 1)
III_PPP_Cent_Overview (REP_BRT_Cent_Overview	Centrifuge Overview (Level 2)

Faceplates
Each Faceplate for each equipment will be called from the AOI as long as the naming convention is followed in Studio5000.

Shortcuts
All Shortcuts for the HMI/OIT/Historian/Data Log/etc have the same naming convention.
Examples:
P648PMPPLC01 (Line Creek Pump Station PLC)
P652PMPPLC01 (Buckeye Pump Station PLC)
P635PMPPLC01 (Gooseneck Pump Station PLC)
P669PMPPLC01 (Round Grove Pump Station PLC)

OIT

Application Name in FactoryTalk View Studio – View Machine Edition that contains configuration information for the PanelView's System Settings, Graphics Displays, Alarm Setup, Communication Setup, System Policies, Networks and Devices, Users, and Groups. Using standard names will ensure that the files are organized.

Application Name

The application name can be up to 32 characters long, and must be unique to the application. The application file is given the extension .med. Applications will be Archived using the Rockwell Software Application Manager "Backup application" program. This Archive will be named the same as the Application with a .apa extension.

The OIT names for KCMO Wastewater will need to adhere to a 11 character limit. The OIT name will begin with the customer code "KCMO_" and "PPP" (Name of the Facility) and then the facility type "FFFF" PS (Pump Station), FS (Flood Station).

Example:
KCMO PPP FFFF
KCMO Gooseneck PS
KCMO RoundGrove PS
KCMO LineCreek PS

Tags

Use Direct Reference tags for two reasons,
1. To save memory in the FTView ME application. The PlantPax Global Objects, Displays, and Images will take up most of the memory.
2. When converting from ME to SE only the Global Objects on the graphic screens will need to be swopped out for the SE version.

Displays

Each file name will begin with a prefix of the Integrator code III_ proceeded by Site Name code PPP_. The file will then contain a descriptive filename for the area it depicts.

Examples:

III_PPP_Home (REP_BRT_Home)	Site Home Screen (Level 1)
III_PPP_Overview (REP_BRT_Overview)	Site Overview (Level 2)
III_Alarm_Summary (REP_Alarm_Summary)	Alarm Summary
III_PPP_Cent_Home (REP_BRT_Cent_Home)	Centrifuge Home Screen (Level 1)
III_PPP_Cent_Overview (REP_BRT_Cent_Overview	Centrifuge Overview (Level 2)

Faceplates

Each Faceplate for each equipment will be called from the AOI as long as the naming convention is followed in Studio5000.

OIT FTView ME Application Settings

Project Settings

Runtime/Auto Log Out,

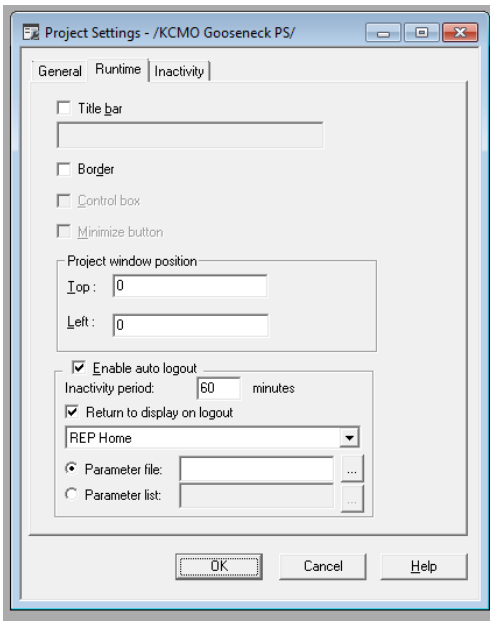


Figure 3 – Project Settings

Diagnostics List Setup

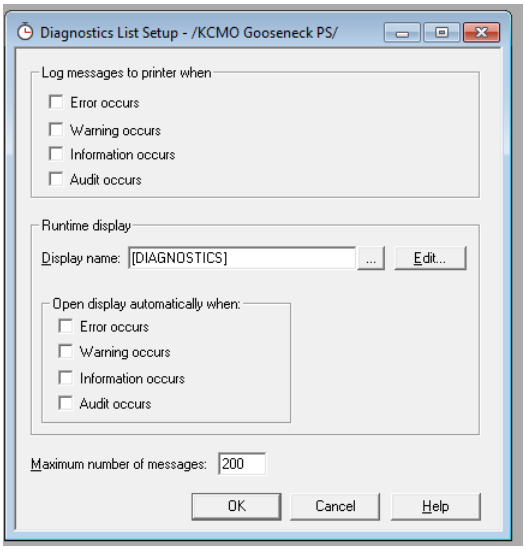


Figure 4 – Diagnostics List Setup

Global Connections

Global Connections will be used for

Date and Time

Updating OIT system Date/Times from associated PLC

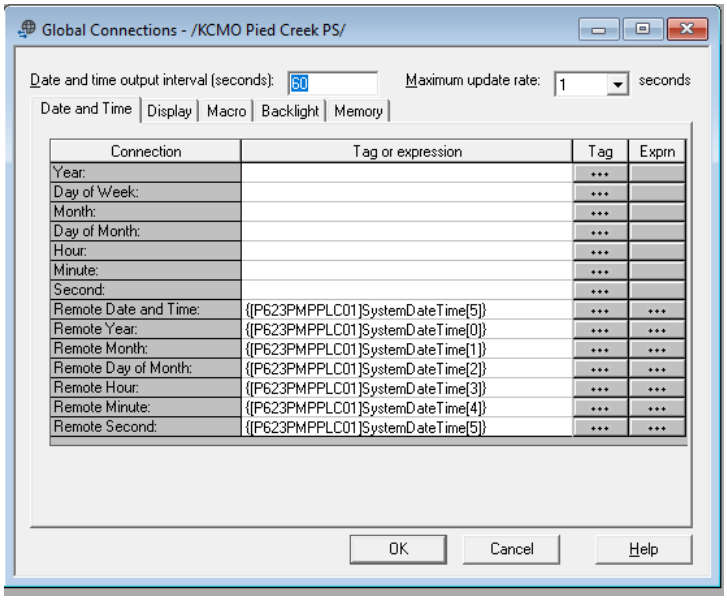


Figure 5 – Global Connections/Date and Times

Display

Remote Display Number call, Tag name “RemoteDisplayTag” This used for calling a certain display for Data Logging to a USB stick.

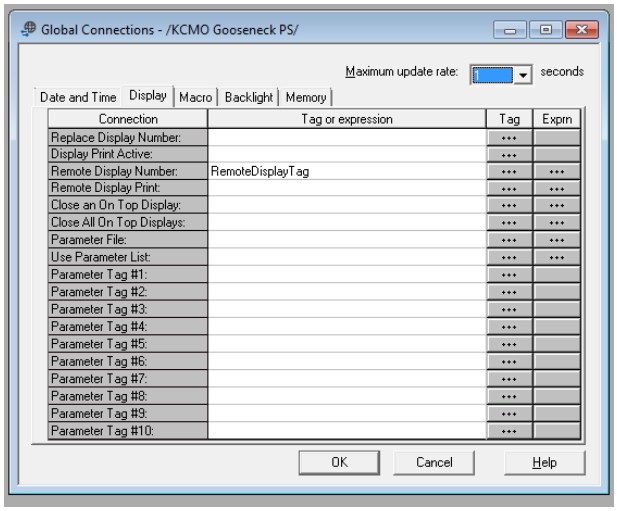


Figure 6 – Global Connections/Display

Startup

Start the following, Alarms/Data logging/Initial graphic displays.

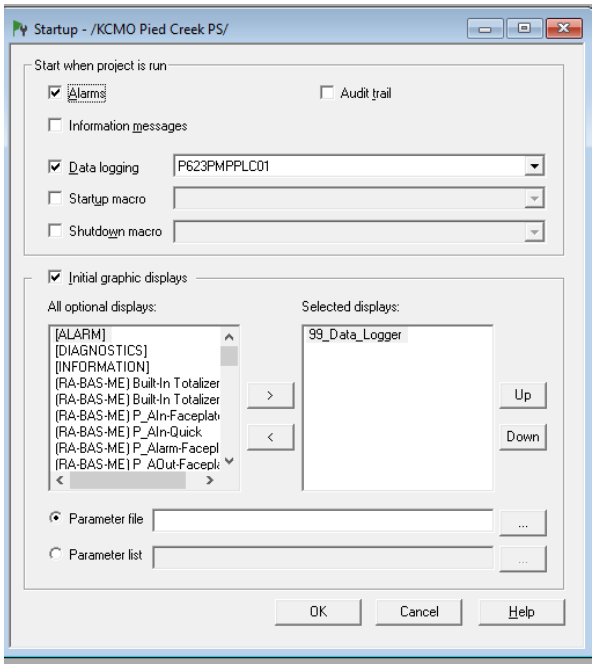


Figure 7 – Startup

Datalogging to a USB

Import the “99_Data_Logger” screen,

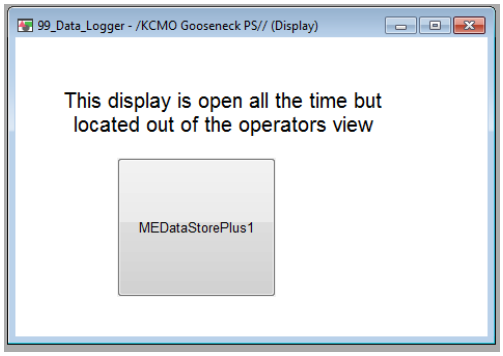


Figure 8 – Datalogging to a USB

Check Display Settings “General” Tab is set as follows,

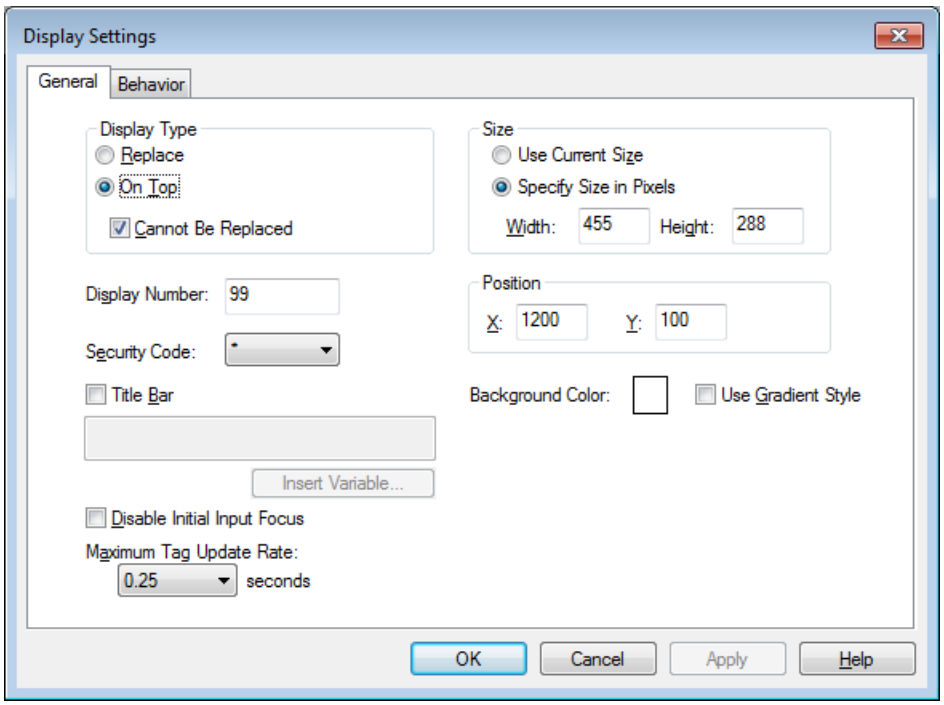


Figure 9 – Display Setting/General

Check Display Settings “Behavior” Tab is set as follows,

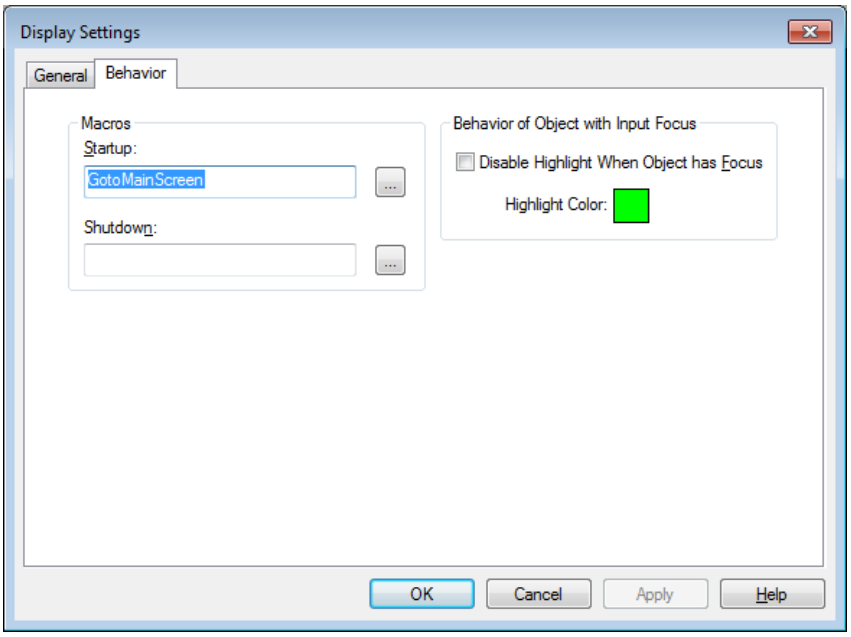


Figure 10 – Display Setting/Behavior

ME DataStore Plus Properties

Check “General” Tab is set as follows,

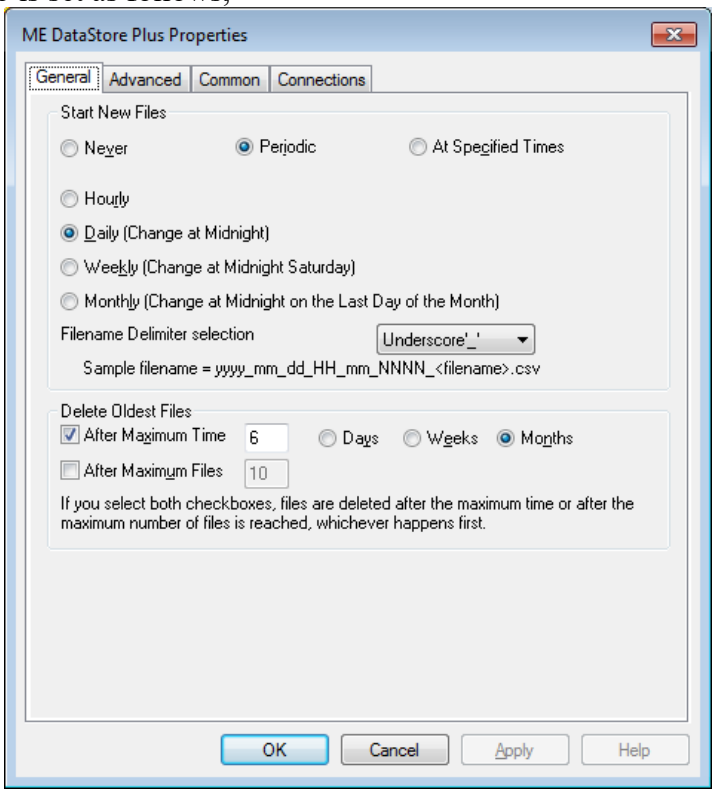


Figure 11 – ME DataStore Plus Properties/General

Check “Advanced/Common” Tabs is set as follows,

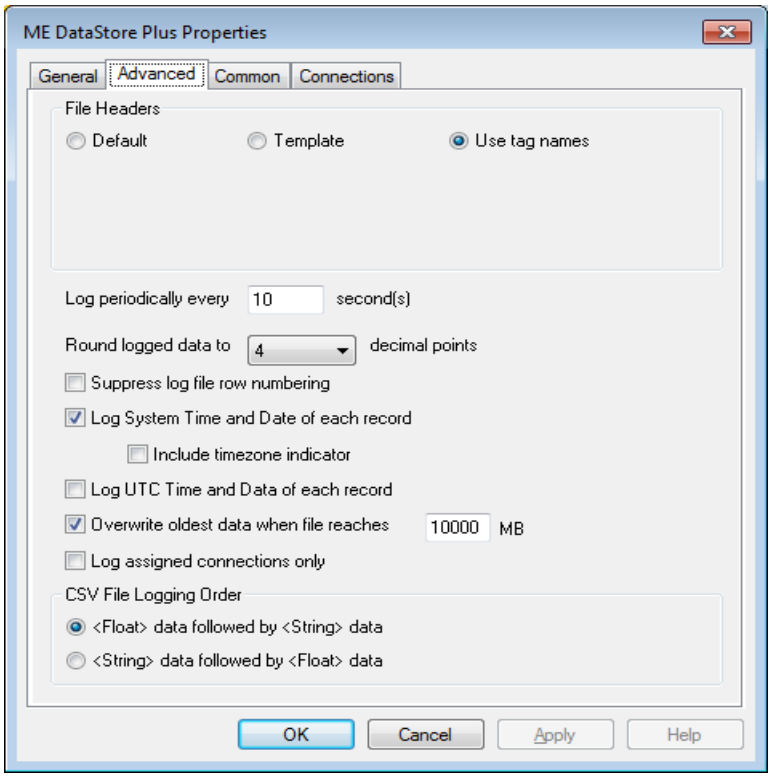


Figure 12 – ME DataStore Plus Properties/Advanced

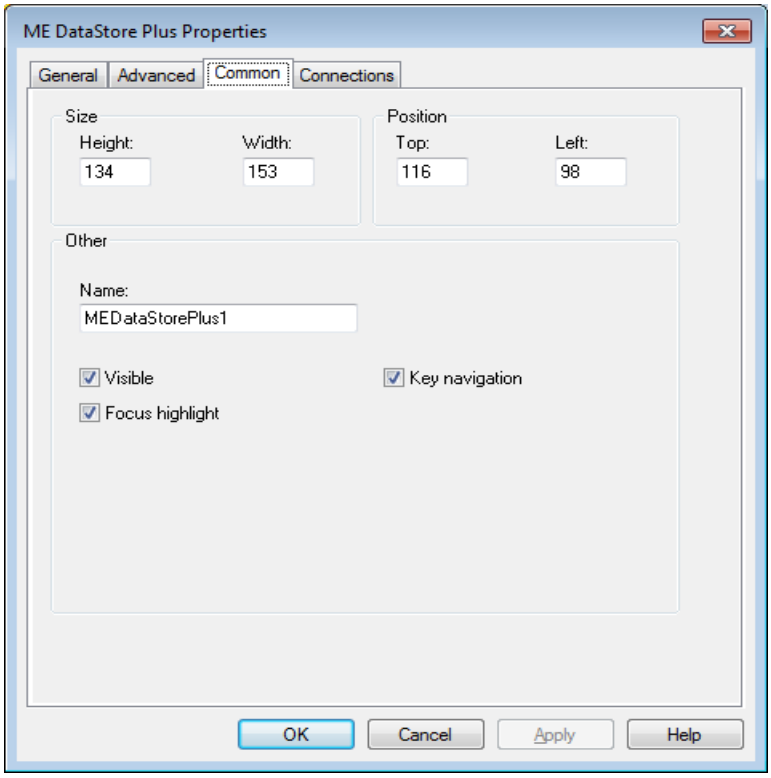


Figure 13 – ME DataStore Plus Properties/Common

Connections Tab

This is where tags are added for writing to a USB into an Excel spread sheet.

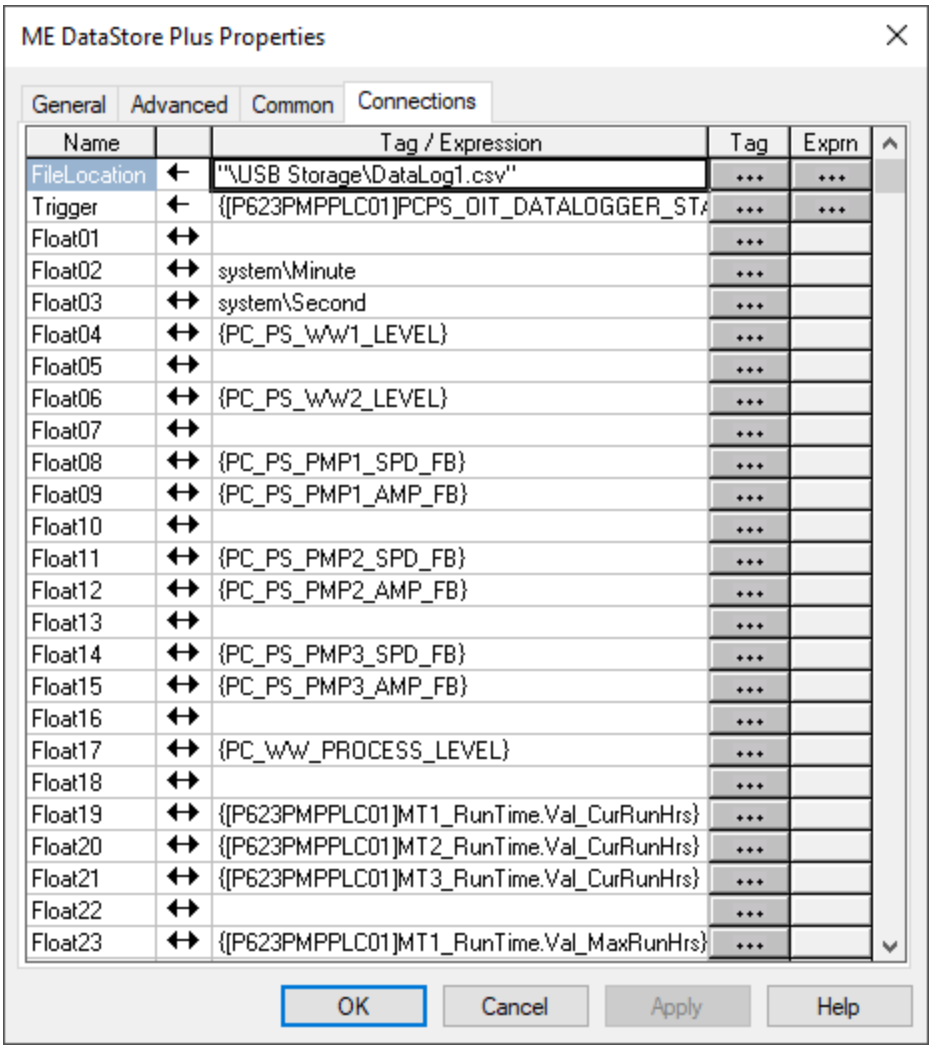


Figure 14 – ME DataStore Plus Properties/Connections

Controller Tag in the PLC for starting the Data Logger. This tag is always true.

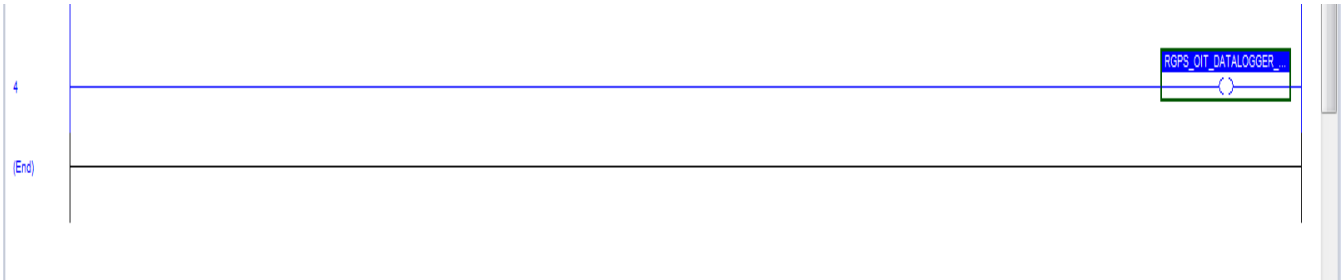


Figure 14a – PLC DataLogger Start Tag

Macro

GotoMainScreen,

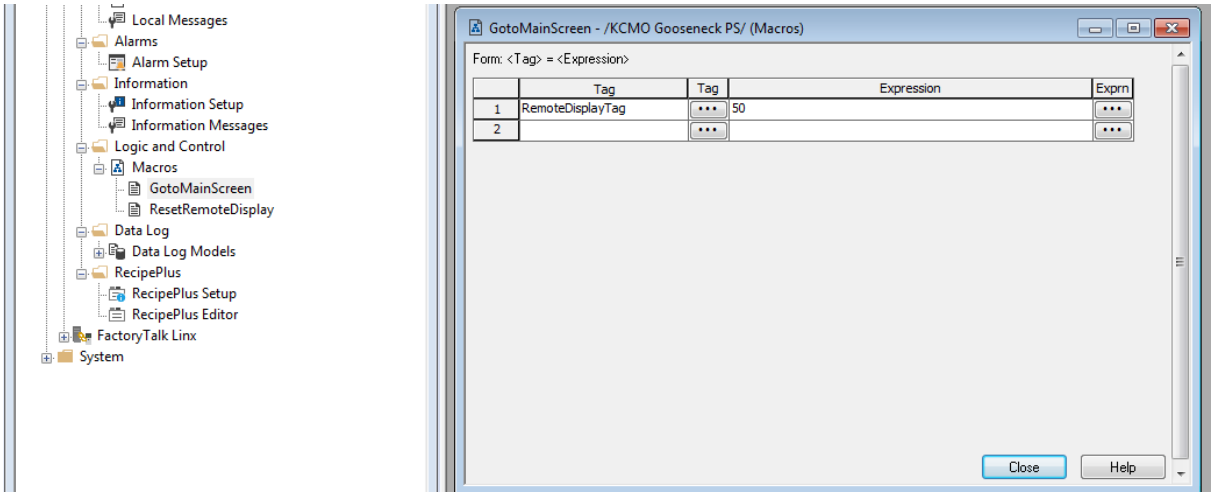


Figure 15 – Macro/GotoMainScreen

ResetRemoteDisplay,

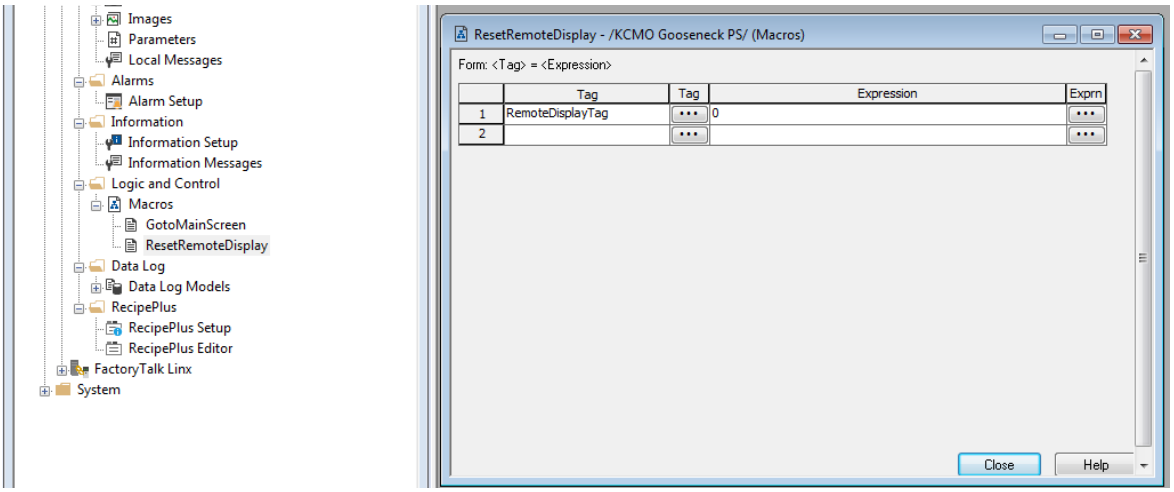


Figure 16 – Macro/ResetRemoteDisplay

Data Log

Set “Setup” Tab with the following format,

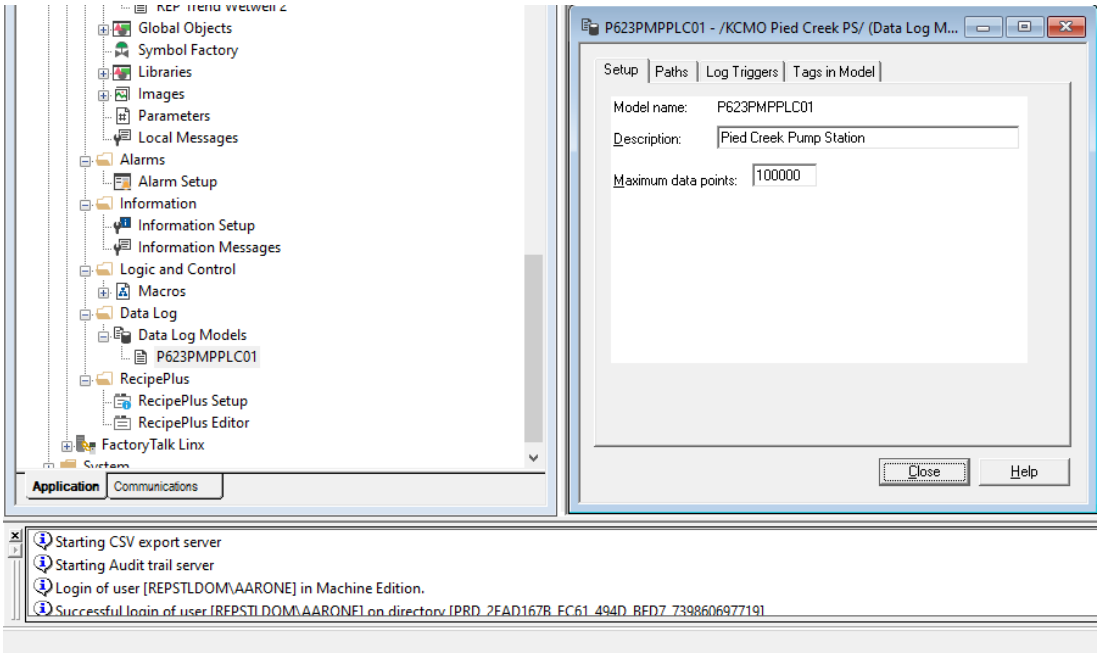


Figure 17 – Data Log/Setup

Set “Paths” Tab with the following format,

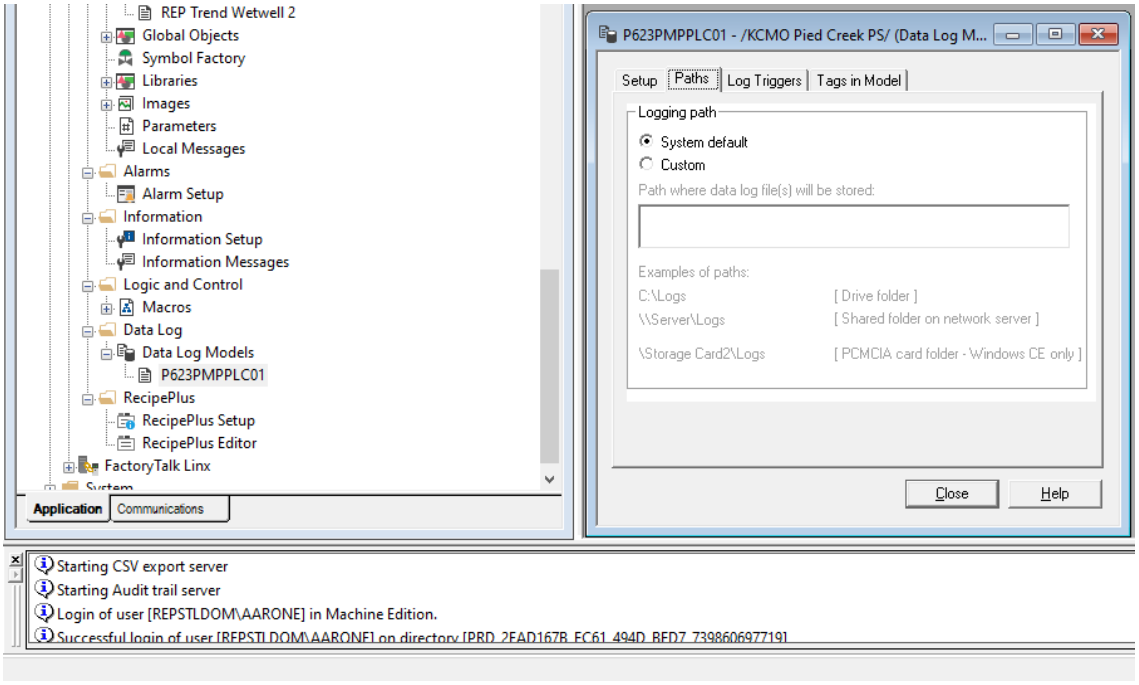


Figure 18 – Data Log/Paths

Set “Log Triggers” Tab with the following format,

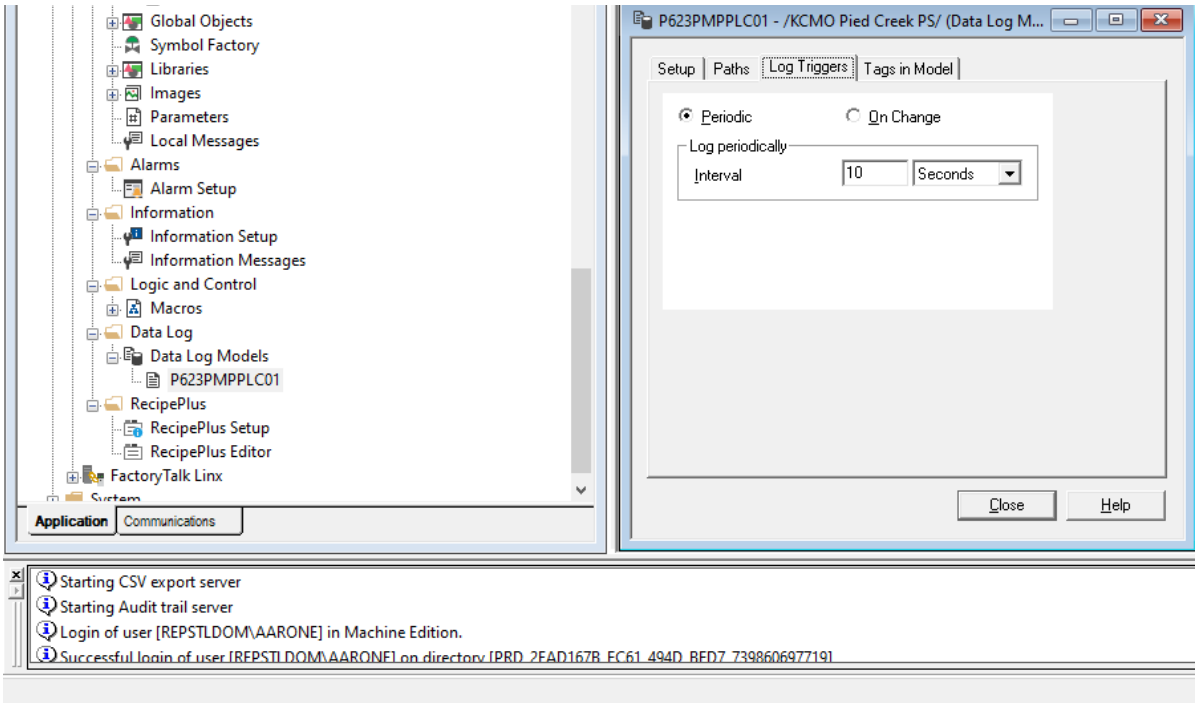


Figure 19 – Data Log/Log Triggers

Set “Tags in Model” Tab with the following format, (Max of 100 Tags for a FTView ME Data Logger)

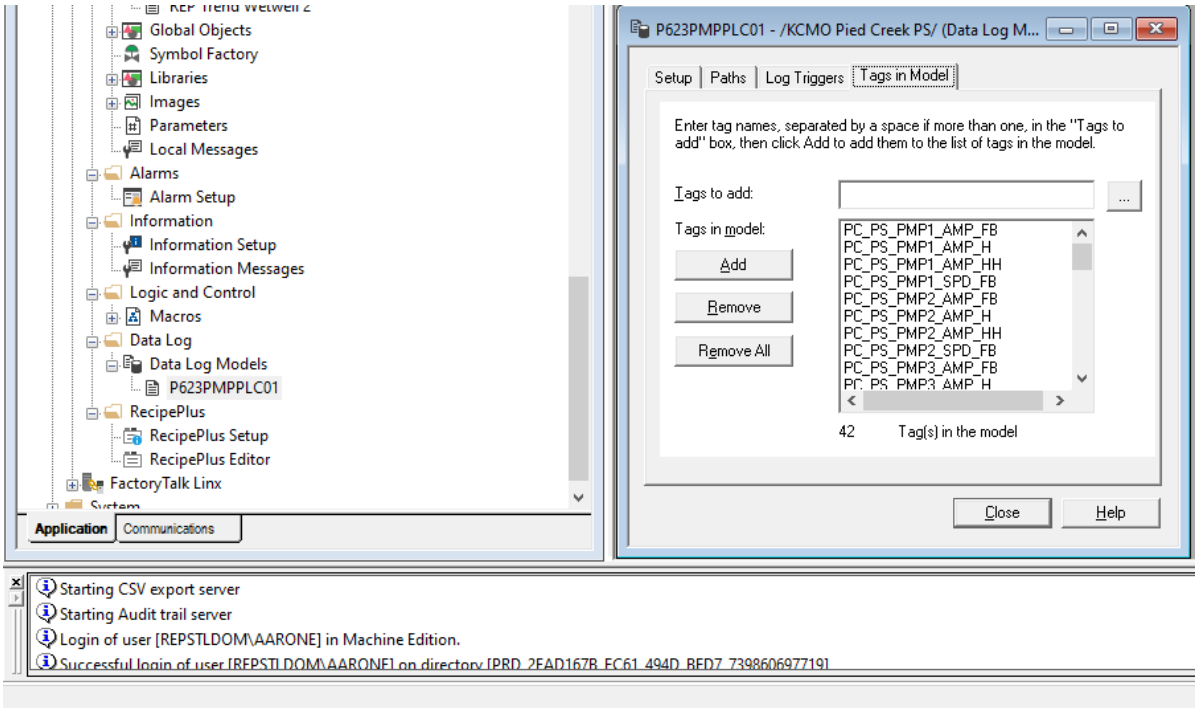


Figure 20 – Data Log/Tags in Mode

PLC

The ControlLogix PLC program is kept in 1 file with extension Name.ACD. Names cannot contain two contiguous underscore characters.

The PLC names will need to adhere to a 20 character limit. The PLC name will begin with the site name “PPP_” and then the facility type “FFFF” PS (Pump Station), FS (Flood Station).

The PLC name standard is:

PPPPFFFPLC01 (20 Characters Maximum)

Where:

PPPP_ = Site Number
FFF = Process, PMP (Pump), SCR (Screen)

Examples:

P635PMPPLC01	Gooseneck Pump Station
P648PMPPLC01	Line Creek Pump Station
P609PMPPLC01	Milwaukee Flood Station

If a Data Concentrator PLC is needed it will have this format:

PPPPIIFFPLC01 (20 Characters Maximum)

Where:

PPP_ = Site Number
II_ = (PP) PlantPax
FF = DC (Data Concentrator)

Examples:

P710PPDCPLC01	Blue River WWTP PlantPax Data Concentrator
P805PPDCPLC01	North Oak Tower PlantPax Data Concentrator

Thin Clients

Each Thick or Thin Client computer on a network is known as a "Remote Desktop". All clients on Thin Manager network must have unique names. Client names will not be the same name as the Microsoft computer name. Client names can be up to eighteen characters long. They can include alphanumeric characters but must begin with a letter. Special characters cannot be used. Client names will use the following convention.

The Client name standard is:

PPPPEEE#### (18 Characters Maximum)

Where:

PPPP = WW(Facility Number)
EEE = OWS, (Designates Operator Work Station)
= 01, Designates the number of the client

Client Name Examples:

WW710OWS01	Operator Work Station No.1
WW710OWS02	Operator Work Station No.2

PC Microsoft computer name (Thick Clients only)

This naming convention only relates to existing hardware at the KCMO Blue River WWTP that are classified as Thick Clients. Unlike Thin Clients Thick Clients have an Operating System as in Windows 10. .All new hardware are Thin Clients. Thick Client names can be up to eighteen characters long. They can include alphanumeric characters but must begin with a letter. Special characters cannot be used. Thick Client names use the following convention.

Where:

PPPP = BRWWTP, Facility Name.
EEE = OWS, (Designates Operator Work Station)
= 01, Designates the number of the client

Client Name Examples:

BRWWTP-OWS01	Blue River WWTP Operator Work Station No.1
BRWWTP-OWS02	Blue River WWTP Operator Work Station No.2

For new Thick Clients the naming convention refer back to the Thin Client naming convention.

HMI & OIT Screen Design

The following section will describe the design parameters used for HMI development.

HMI Screen Resolution

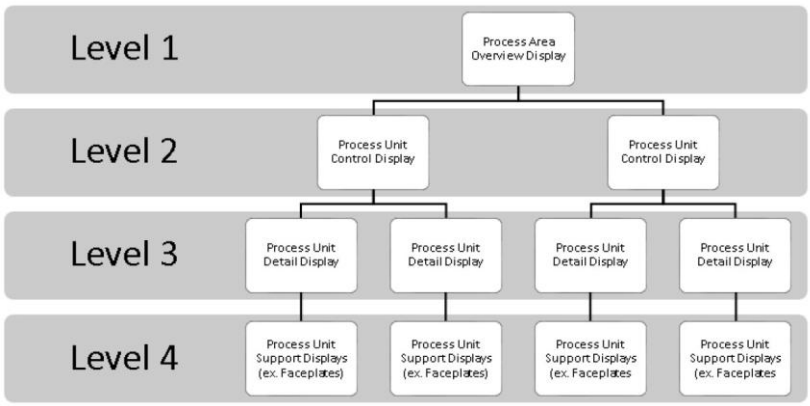
All HMI screens will use a resolution of 1920 x 1080

1 Display Levels

Understanding the users' goals, tasks, and mental model is crucial to determining the organization of the displays in an HMI project. They should be organized for the primary user as identified in user research. In most cases this is the operator. Secondary users need to be considered as well, but the information they need can be provided on separate displays or workstations.

The hierarchy and organization of the displays should be created to provide progressive disclosure of information. A clean, simple display with an overview of the operations should lead to other displays that contain more complexity and detail as users navigate deeper into the hierarchy. Using this methodology provides a quick look and allows the user to initiate the action of diving deeper for more information rather than having it clutter the initial display. There are four levels that are recommended for the display hierarchy, each level providing more detail than the previous level.

Each screen to have a facility header code and name.
Example (710 – Blue River WWTP Primary Solids)



Level 1: Overview Display

Provides an overview of the operator's entire span of responsibility.

Level 2: Process Unit Control Display

Operator's primary operating display. Used during normal operations, routine changes, and monitoring.

Level 3: Process Unit Detail Display

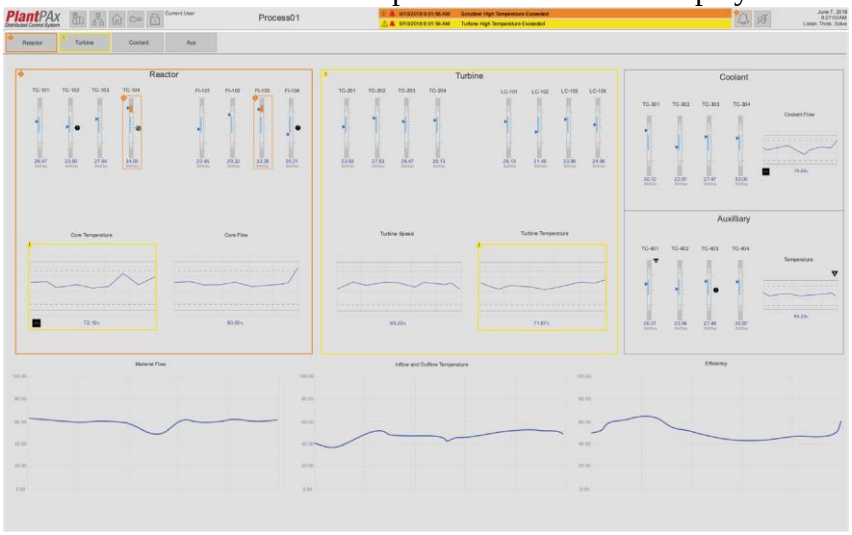
Non-routine operations. Provides sufficient information to facilitate process diagnostics.

Level 4: Process Unit Support Display

Interlocks, Diagnostics, Help, and Documentation; delivered on faceplates or popup displays.

1.1 Level 1 Displays: Process Overview

Level 1 displays contain high-level overview information that can be assimilated quickly, provide clear indication of current performance, and highlight anything that requires immediate attention. Control should not be performed from this display.



Example Level 1 display

Level 1 displays contain the following types of elements:

- High-level Key Performance Indicators (KPI)
- Alarms of top 2 or 3 highest priorities
- Important calculated parameters and conditions
- Important information from upstream and downstream units
- Advanced control mechanisms performance and status
- Major equipment status
- Appropriate trends of important parameters
- Indications of abnormal situations, denoting severity

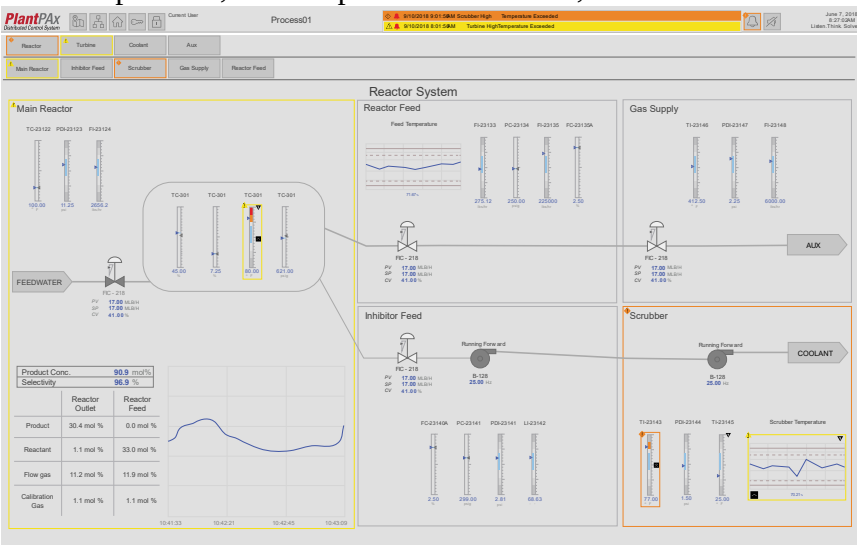
There should only be one overview display for a specific operating position; however, there may be different ones for different modes or process changes such as batch.

Level 1 displays are crucial as they provide contextual information; however, they may not contain all information users need to perform their jobs. Instead, they provide current state of operations, indications of abnormal situations that may be occurring, and quick and easy access to additional information.

Level 1 displays should be designed secondarily to Level 2 displays.

1.2 Level 2 Displays: Process Unit Operating Graphics

Level 2 displays are the primary displays used for operators to perform their tasks and should be designed first. Level 2 displays should match the users' mental model of the machine and operation and provide easy access to related displays in the display hierarchy. There may be multiple Level 2 displays for the same equipment to cover specific situations such as startup, normal operation, state or product transitions, and shutdown.



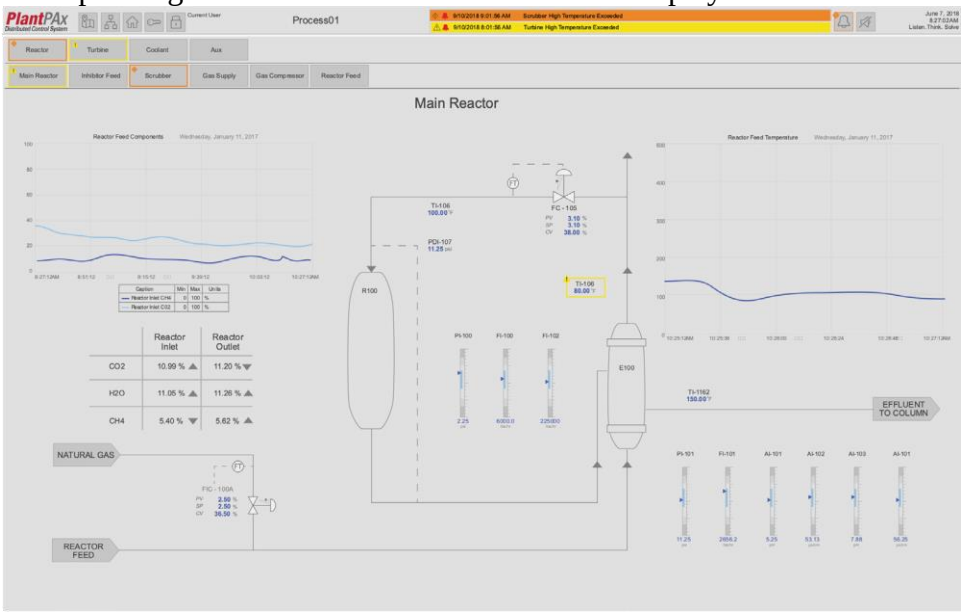
Example Level 2 display

Level 2 displays contain the following types of elements that are relevant to the tasks to be accomplished by that display:

- Key Performance Indicators (KPI)
- All alarms relevant to this display (if constrained by space, then alarms of top 2 or 3 highest priorities with indication there are additional alarms not being displayed)
- Controls needed to accomplish tasks (or access to controls, such as easy access to faceplates that contain controls)
- Indicators needed to accomplish tasks
- Navigation to related displays
- Navigation to overview display
- Navigation for continuation of flow lines
- Indications of abnormal situations, denoting severity

1.3 Level 3 Displays: Process Detail Displays

Level 3 displays contain much more detail and controls. They contain detailed view of sub-units, individual equipment items, components, and their related controls and indications. They are used for detailed investigations and interventions and are intended primarily for troubleshooting or manipulating items not accessible from Level 2 displays.



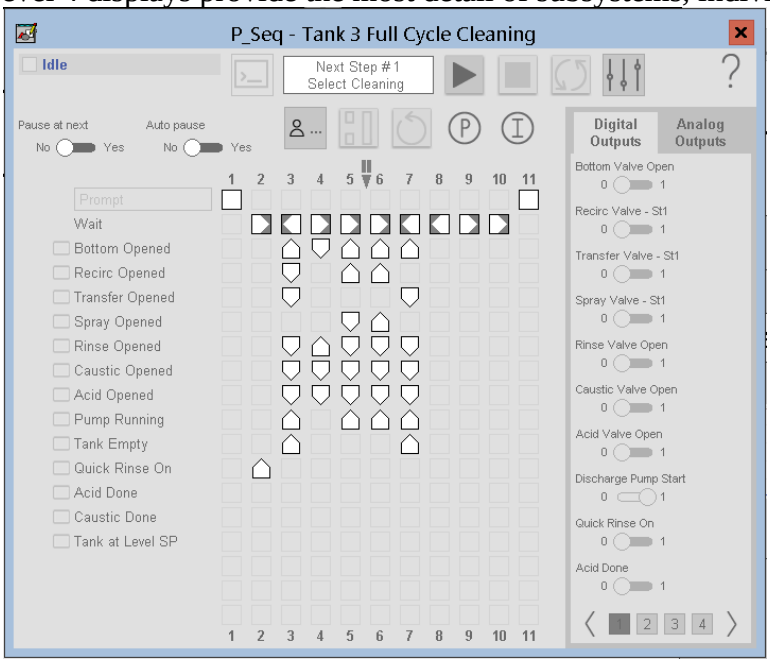
Example Level 3 display

Level 3 displays contain the following types of elements that are relevant to the tasks to be accomplished by that display:

- Alarms of all priorities relevant to that display
- Controls
- Indicators
- Detail view of equipment

1.4 Level 4 Displays: Process Support and Diagnostics Displays

Level 4 displays provide the most detail of subsystems, individual sensors, or components.



Example Level 4 display

Examples include:

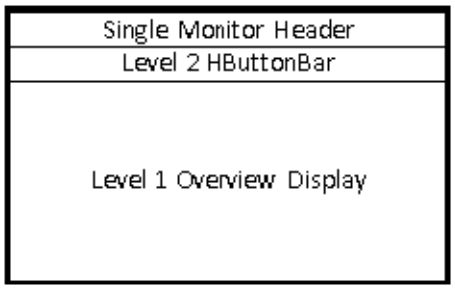
- Alarm displays with details of individual sensor status
- Detailed info about equipment and instrumentation
- Detailed status of Advanced Process Control functionality
- System-supplied displays such as point detail, system diagnostics, alarm summary, etc.
- Help displays
- Operating procedures
- Alarm documentation and response guidance

2 Standard HMI Template

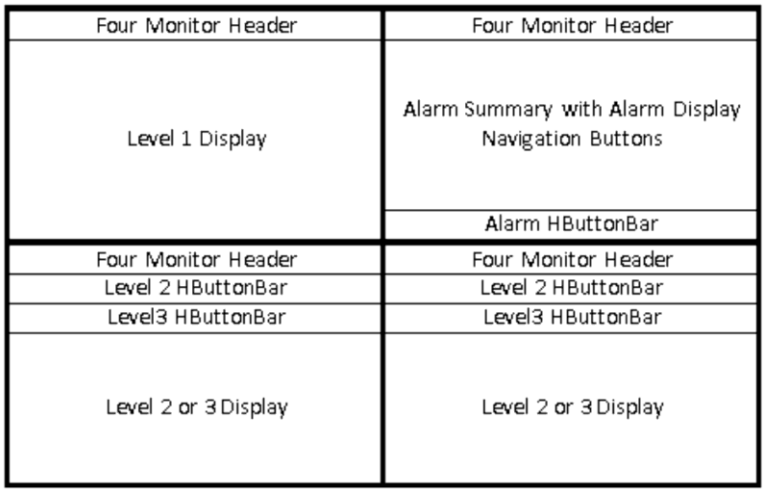
Rockwell Automation provides a configurable PlantPAx HMI template that can serve as a starting point for developing a new project. Templates are applied in Studio 5000 Architect and used in FactoryTalk View SE to build an HMI application. Multiple monitors are supported in the template, allowing you to implement displays on a single- or four-monitor workstation. For more information on this template, visit publication PROCES-UM003 *(PlantPAx Distributed Control System Application Configuration)* or download from the Rockwell Automation Product Compatibility and Download Center (PCDC).

2.1 Layout

The single monitor HMI template configuration is below. Users view, control, and navigate from one display.



The following image is of a four monitor HMI template configuration.

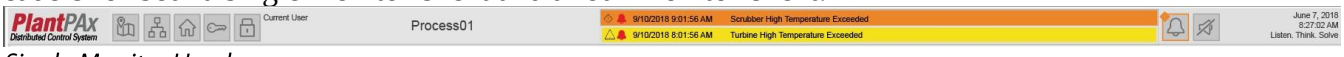


A four monitor widescreen layout with 1920x1080 screen resolution is utilized in the standard template. Level 1, Level 2, and Level 3 displays are provided as a part of the template along with navigation objects that promote display invocation from one monitor to another. Alarms and trends can be filtered as a part of the display yoking when a process area is changed from the navigation on the Level 1 display.

The HMI template requires that displays and alarms be organized using the Display Levels outlined in Section 3 of this document. For each display level, the HMI template provides not only the display framework, but also global objects that can be used. Navigation menus and headers for both one- and four-monitor configurations are also provided.

2.1.1 Header

Headers contain functionality that provides access to information. The HMI template includes headers for both a single monitor client and a four-monitor client.



Single Monitor Header

This header includes the following components:

- Display Navigation Map
- System Status
- Return to Home Screen Button
- Client Login/Logout Buttons

- Alarm and Event Banner
- Alarm Access
- Alarm Silence

Four Monitor Header

The four monitor header includes the same buttons as the single monitor header except for the alarm access button. Another difference is in the lack of an alarm and event banner. Instead, the alarm summary is continuously displayed on monitor 2. Lastly, the four monitor header includes a "Refresh all Monitors" button instead of the "Return to Home Screen" button.

2.1.2 Button Bars

The level 2 Button Bar is used for navigating through level 2 displays.

The level 3 Button Bar is used for navigating through level 3 displays.

The button bars change based on context. For example:

- If users change the Process Area, then Level 2 buttons will display the Level 2 displays for that Process Area
- If users change a Level 2 display, it will display buttons for Level 3 displays relevant to that Level 2

For a single-monitor configuration:

- Level 2 button bar appears on Level 1, Level 2, and Level 3 displays
- Level 3 button bar appears on Level 2 and Level 3 displays.

For a four-monitor configuration:

- Level 2 button bar only appears on Level 2 and Level 3 displays
- Level 3 button bar also appears on Level 2 and Level 3 displays.

2.1.3 Level 1 Display

The Level 1 display in the HMI template is used as an Overview Display as described in 3.1 of this document:

- For a single monitor configuration, the Level 1 display contains a header and Level 2 buttons
- For a four-monitor configuration, the Level 1 display contains only a header.

2.1.4 Level 2 and 3 Displays

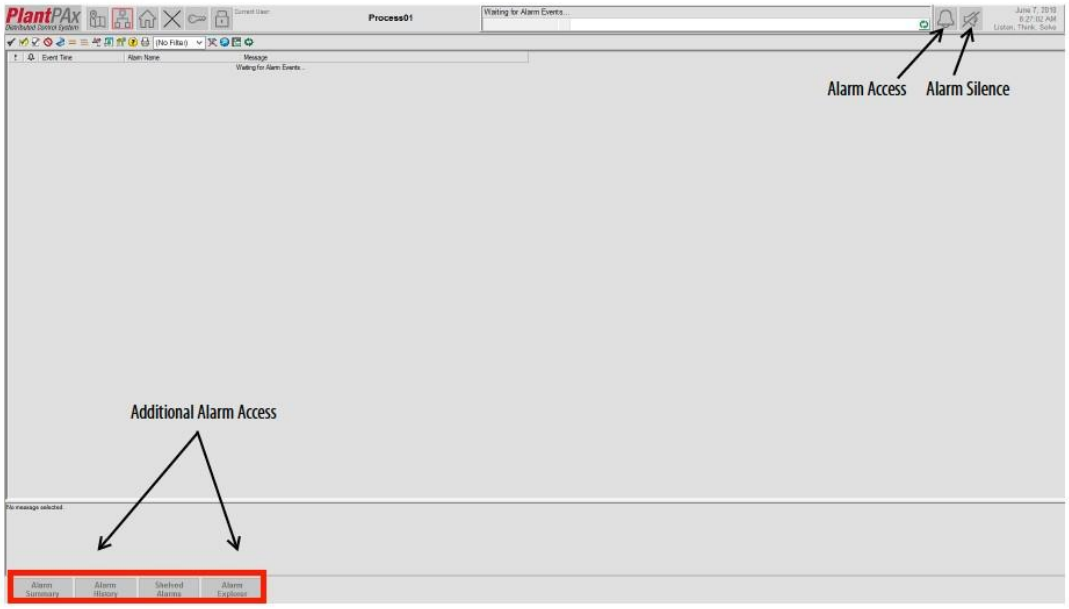
The HMI template display can be used for Level 2 and Level 3 displays. Level 2 displays are the main displays to perform tasks as described in 3.2 of this document. Level 3 displays are used when additional detail or controls are required as described in 3.3 of this document.

- For a four-monitor configuration, monitors 3 and 4 display the Level 2 and Level 3 displays.

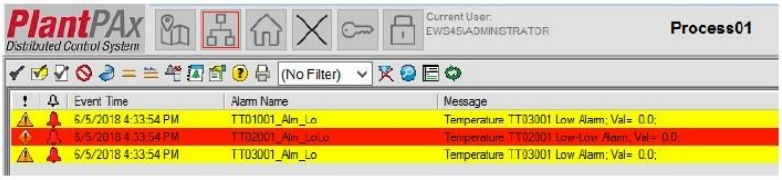
- For both single monitor and four-monitor configurations, Level 2 and Level 3 displays contain a header, Level 2 button bar, and Level 3 button bar for navigation.

2.1.5 Alarm Summary

The alarm summary displays alarms for the selected Process Area. If users change the Process Area using the Display Navigation Map, the alarm summary will update to show relevant alarms.



Below is an example of alarms in the Alarm Summary.



At the bottom of the alarm summary are navigation buttons to additional alarm screens.

- For single-monitor configuration, the Alarm Summary is accessed using the bell icon button in the header
- For four-monitor configuration, the alarm summary is continuously displayed on monitor 2

3 HMI Instance Configuration

Each HMI instance should have its own client file. A client file defines the characteristics of how the client runs including startup displays, macros that will run at startup, whether a Windows title bar is displayed, and other configuration properties. Each instance of the HMI template deployed in a distributed system operates independently of all other template deployments.

3.1 Standard System Functionality

The design of the template provides the operator with an effective and efficient interface to control and monitor the process facility or area. Alarm grouping and naming, which facilitates effective communication of alarms in a logical manner, is described later in this document. Navigation objects are included that provide the yoking functionality that minimizes the number of clicks to perform operations and simplifies the navigation workflow for operators.

4 Operator Interaction Methodologies

When designing an HMI, it is important to consider the method in which users interact with the application:

- Touch (touch tool such as touch pen, hand, gloved hand, etc.)
- Keyboard
- Mouse or trackball

The Library of Process Objects natively supports all of these interaction methods. Key factors to keep in mind are the interaction methods that affect the size of the hit zones. For example:

- Touch requires a larger hit zone and spacing between hit zones so there is not accidental activation of objects.
- For keyboard and mouse, hit zones can be smaller due to accuracy and size of the mouse pointer.

Refer to **Section 8.15 Input Controls** for more details about appropriate sizing.

5 Display Layout and Design Considerations

The information on HMI displays should:

- Meet the needs of the users
- Match users' understanding of operations and how the information is related
- Show only the necessary information for the task
- Allow users to quickly understand current and future status and system response to actions
- Reduce visual clutter

To meet these goals, first determine:

- Users' goals, tasks, and mental model
- Information and controls that are necessary for the task
- The most appropriate way of representing the information and controls
- Contextual information that is of value for each element of information
- How to group information
- How to highlight key information
- How to assist with situation awareness
- How to physically layout and align information

IMPORTANT: Displays should be designed for the primary (typically the operator) users while still supporting secondary users. The latter will still use the HMI, but the information they need can be provided on secondary displays or pop-up screens.

5.1 Users' Goals, Tasks, and Mental Model

Understanding the users' goals, tasks, workflow, and mental model is a critical first step in HMI design and should be completed by observing and interviewing users to document:

- Their job goals and related tasks
- Their understanding of how operations work
- How the information and controls of the operations are related
- Their understanding of their tasks

Prototyping new displays with users is another way to gather data on whether the displays meet users' goals, tasks, and mental model. The way users understand operations and their tasks does not always match the way the system is mechanically designed or how the system is laid out in a Piping and Instrument Diagram (P&ID).

A prototype does not need to be drawn with the HMI package that will be utilized, for instance a prototype can be drawn in any drawing package, although if there is already an HMI toolkit available containing the necessary objects that will be used then this would be the quickest way to generate a prototype.

5.2 Necessary Information and Controls

Determining what information and controls are necessary in an HMI requires understanding the users' goals, tasks, and perception of the tasks and operations. Information that is unnecessary clutters the screen and should be eliminated, leaving only information the user needs to successfully execute their job function. Keeping focus on the most critical information can be accomplished using methods such as sizing and placement on display.

HMI displays contain data pixels and non-data pixels. Non-data pixels are any pixels that are not used to display data, including static labels, icons, and lines. All pixels (non-data and data) consume users' attention and memory, so it's important that every pixel has a purpose. Some non-data pixels provide understanding and context and cannot be removed without causing loss of meaning and clarity to the display. These should be visually muted so they do their job without attracting attention.

5.3 Data Presentation

There are different ways to present data on an HMI display. The choice of format is dependent on the type of information, intended message, and users' needs. Only information that is meaningful for the task the user is performing should be presented. It is critical to consistently display the same type of information on the same display, across displays, and throughout the system.

5.4 Contextual Information

For each element on the display, determine what contextual information would help turn that data into useful information. For example, a bar graph can show more than just current state; it

can also indicate high point, low point, alarm points, and set points. This provides context to the users of whether that element is in a good state, bad state, or moving towards a good or bad state. Contextual information can also be provided by placing different data elements next to each other. For example, placing multiple, related bar graphs next to each other inside a tank vessel or showing a trend next to a bar graph provides additional context for that data.

5.5 Grouping

Grouping related information provides additional context, visual cues, and value. For example, when placing several bar graphs of related information next to each other, they should be scaled appropriately so users can easily determine that everything is good if they see a straight line. If that line is not straight, users should be able to identify that there is an issue without having to look for more information or wait for an alarm.
Encourage meaningful comparisons by doing the following:

- Combining items in a single table or graph
- Placing items close to one another
- Linking items in different groups using a common color
- Including comparative values for clarity (i.e. ratios, percentages, or variances)

Grouping can be done by spatially placing related items near each other, using lines, or using background shading. The goal is to reduce visual clutter using the least visible means. Not all information must be compared or linked to everything else. Discourage meaningless comparisons by separating items from one another spatially.

5.6 Highlighting Key Information

Key information and controls should have more prominence than the less important information. This includes information that is always important or information that is only important at the moment. This keeps users from being distracted by less important information.
Highlighting should be done by placement, size, enclosure, and shading/coloring.

- Placement: Top-left region of display is area of greatest emphasis, all else being equal
- Size: Larger items receive more emphasis
- Enclosure: Anything enclosed by borders or surrounded by a fill color can stand out

Keep highlighting to a minimum since displays should only show necessary information and be organized to match the users' mental model and task workflow.

5.7 Situation Awareness

Users need to be aware of the current and future status of the operations and task. While performing a task, it is easy to lose this awareness. The layout of the display should be designed to help users quickly recognize the status of operations, status of the task, and where the operations and task is heading.
Using alarm state icons is helpful for situational awareness. Placing these icons on items that are in alarm and providing a list of the highest priority alarms occurring helps users quickly assess the current situation. Using specific colors to indicate alarms (and not using those colors elsewhere) allows the alarms to stand out against the rest of the information on the screen.
Trends can also give an indication of what the process has been doing and where it may be heading. For example, a temperature may be in the normal range, but if it has been steadily rising

over a period of time, it may eventually rise beyond the high limit. A trend display can quickly show this increase over time while a bar graph or numeric display cannot.

5.8 Physical Layout and Alignment

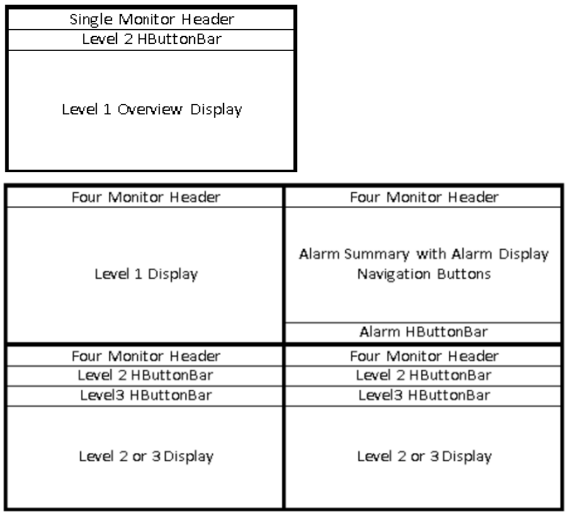
After determining what information needs to be on the display, the designer needs to determine how to physically locate each piece of information on the screen. As previously mentioned, related information should be grouped and key information highlighted. Additionally, if the information is part of the users' mental model (important for accomplishing the task), it may be laid out to match operations. For example, a pump that is vertically higher than a tank can have its information appear higher than the tank on the display. This may be important so users are aware of the physical relation between the two components. Make sure this is necessary information so it does not create visual clutter and restrict the layout of the display.
Basic alignment guidelines:

- Labels for data are to be left justified, with the data to the right or underneath the label
- Numeric data that is related and meant to be compared are to be justified alike, with the decimal points aligning. Usually this means data needs to be right justified
- If the entire display contains unrelated data, then the data is to be left justified
- Engineering units appearing to the right of the numeric values shall be left justified
- Data is not to be center justified unless it appears in a button, table or diagram where center justification is needed
- Align to a grid with attention paid to margins, spacing, and padding

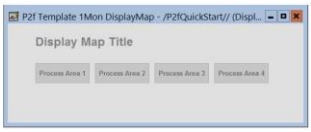
Items on a display should be spaced far enough apart from each other so they do not overlap and are visibly distinct objects, but not spaced so far apart that there is unnecessary unused space on the display. Objects close together are subconsciously grouped together, so place related objects close to each other and unrelated objects farther apart to ensure users perceive the correct relationship of data on a display.
Minimum spacing is 4 pixels to ensure there is no overlapping. For touch interface, spacing is 10 pixels between command touch objects to prevent accidental activation. For navigation touch objects, there should be no additional padding between objects.

6 Navigation Methods

There should be multiple methods of navigation to move through the display hierarchy including main navigation on every display and additional navigation buttons to related displays, such as at the top or bottom of screen or end of a process line. Users should be able to easily navigate without being familiar with the hierarchy. This is particularly useful for maintenance and engineering.
Consideration should also be given to navigation within displays such as tabs or paging. Navigational elements should appear in consistent locations and use consistent buttons, icons, and/or text across faceplates.
The PlantPAx HMI template provides several different forms of navigation, as shown in the following template.



Navigation is available from the header, navigation bar, and display itself. In the top header, there is a button to the Display Navigation Map as shown below. This allows users to switch between process areas.



Each process area contains an overview display, Level 2 displays, and Level 3 displays.
For the single-monitor setup:

- Users navigate to the Level 2 and 3 displays from the overview display
- The top header also contains links to the Alarm Summary

For the four-monitor setup:

- Screens 3 and 4 are dedicated to Level 2 and 3 displays
- Select a process area to invoke a screen update to show information from that process area on all four monitors

On the Level 2 navigation bar, there are buttons that link to the Level 2 displays. This navigation appears on Level 2 and Level 3 displays. For the single-monitor setup, this also appears on Level 1 displays.

On the Level 3 Navigation Bar, there are buttons that link to level 3 displays. This navigation appears on Level 2 and Level 3 displays. Faceplates also have navigation as part of the faceplate object. Refer to Section 8.16 Faceplates and Popups for more details.

7 Design Application Standards

This section contains application standards that are used in the Library of Process Objects and should be used to ensure consistency and effectiveness in the HMI design.

Refer to publication PROCES-RM002 (Rockwell Automation Library of Process Objects: Configuration and Usage) and publication PROCES-RM014 (Rockwell Automation Library of Process Objects: Display Elements) for additional details not included in this document.

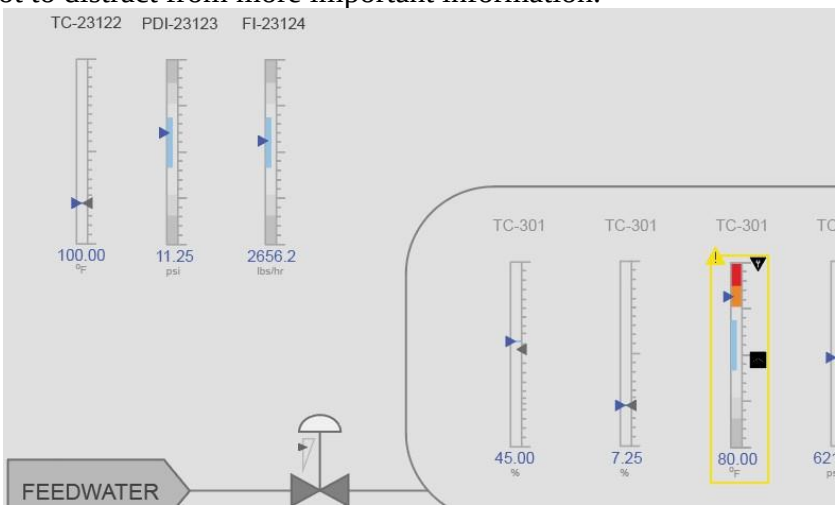
7.1 Color Conventions

The following color conventions shall be used in developing Wastewater Scada HMI and OIT graphic screens.

Notification Color Use	Alarms/Severity	Color Name	Definition
Low Priority Alarm	Input Failure=1, No Motors to Stop=100, I/O Fault=200, Analog Rate of Change=250,	Magenta	R145 G106 B173 #916AAD Range 1-250
Low Priority Alarm Foreground		White	R255 G255 B255 #FFFFFF
Medium Priority Alarm	(Analog) Low=350, (Analog) Low-Low=450, Interlocks=500	Yellow	R245 G225 B027 #F5E11B Range 251-500
Medium Priority Alarm Foreground		Dark Gray 63	R063 G063 B063 #3F3F3F
High Priority Alarm	(Analog) High=700, (Digital, if two Floats present) High=700. Transit Stall=700, Fail to Stop=725, Fail to Start=750, Trip Fault=750, Actuator Fault=750,	Orange	R236 G134 B041 #EC8629 Range 501-750
High Priority Alarm Foreground		White	R255 G255 B255 #FFFFFF

Urgent Priority Alarm	No Motors to Start=800, Full Stall=850, (Analog) High High=1000, (Digital, for only one Float present) High High=1000, Comm Failure=1000,	Red	R226 G032 B040 #E22028 Range 751-1000
Urgent Priority Alarm Foreground		White	R255 G255 B255 #FFFFFF

Below is an example image of appropriate use of color. Color is reserved for live data and alarms, with the alarms having more noticeable colors. All other objects use shades of gray so as not to distract from more important information.



Example Appropriate Use of Color for Data

Below are the colors used in the PlantPAx library. Follow these colors when creating your own HMI elements to ensure consistency in the HMI.

Display Color Use	Color Name	Definition
Display Background (no tabs)	Light Gray 224	R224 G224 B224 #E0E0E0
Tab Panel Background	Light Gray 224	R224 G224 B224 #E0E0E0
Display Background behind tabs (with tabs)	Silver 192	R192 G192 B192 #C0C0C0
Static Object Color Use	**Color Name**	**Definition**
Title Foreground	Dark Gray 63	R063 G063 B063 #3F3F3F
Group Heading Foreground	Dark Gray 63	R063 G063 B063 #3F3F3F
Column Heading Foreground	Dark Gray 63	R063 G063 B063 #3F3F3F
Separator Line Color	Light Gray 216	R216 G216 B216 #D8D8D8
Process and Connector lines	Gray 160	R160 G160 B164 #A0A0A4
Equipment Border	Gray 160	R160 G160 B164 #A0A0A4
Grouping Box	Light Gray 232	R232 G232 B232 #E8E8E8
Notification Color Use	**Color Name**	**Definition**
Low Priority Alarm	Magenta	R145 G106 B173 #916AAD
Low Priority Alarm Foreground	White	R255 G255 B255 #FFFFFF
Medium Priority Alarm	Yellow	R245 G225 B027 #F5E11B
Medium Priority Alarm Foreground	Dark Gray 63	R063 G063 B063 #3F3F3F
High Priority Alarm	Orange	R236 G134 B041 #EC8629
High Priority Alarm Foreground	White	R255 G255 B255 #FFFFFF
Urgent Priority Alarm	Red	R226 G032 B040 #E22028
Urgent Priority Alarm Foreground	White	R255 G255 B255 #FFFFFF
Program Error/Bad Configuration	Black	R000 G000 B000 #000000
Program Error/Bad Configuration Foreground	White	R255 G255 B255 #FFFFFF
Fault Condition Background	Black	R000 G000 B000 #000000
Fault Condition Foreground	White	R255 G255 B255 #FFFFFF
Warning Condition Background	Dark Gray 63	R063 G063 B063 #3F3F3F
Warning Condition Foreground	White	R255 G255 B255 #FFFFFF
Prompts and Attention Background	Light Gray 224	R224 G224 B224 #E0E0E0
Prompts and Attention Foreground	Black	R000 G000 B000 #000000
Testing or Simulation Background	Light Gray 224	R224 G224 B224 #E0E0E0
Testing or Simulation Foreground	Black	R000 G000 B000 #000000
Other Abnormal State Background	Light Gray 224	R224 G224 B224 #E0E0E0

Other Abnormal State Foreground	Black	R000 G000 B000 #000000
If the normal state can appear in a control showing a notification, then the colors used for the normal state shall follow either State or Dynamic Data color uses standards		
Element State Color	**Color Name**	**Definition**
Off/De-energized/Idle/Stopped/Closed		
Off/De-energized/Idle/Stopped/Closed	Gray	R128 G128 B128#808080
On/Energized/Running/Open	Off White	R240 G240 B240 #F0F0F0
Disabled/Out of Service	Gray	R128 G128 B128 #808080
Manual Operations (Jogging)	Light Blue	R147 G194 B228 #93C2E4
Transition (Starting, Stopping, Accelerating, Decelerating, Opening, Closing)	Light Blue	R147 G194 B228 #93C2E4
Data Entry Color	**Color Name**	**Definition**
Label Foreground	Dark Gray 63	R063 G063 B063 #3F3F3F
Engineering Unit Foreground	Light Gray 91	R145 G145 B145 #919191
Input Field Foreground (edits allowed)	Dark Gray 63	R063 G063 B063 #3F3F3F
Checkbox Foreground (edits allowed)	Dark Gray 63	R063 G063 B063 #3F3F3F
Radio Button Foreground (edits allowed)	Dark Gray 63	R063 G063 B063 #3F3F3F
Input Field Foreground (edits prohibited)	Gray	R192 G192 B192 #C0C0C0
Checkbox Foreground (edits prohibited)	Gray	R192 G192 B192 #C0C0C0
Radio Button Foreground (edits prohibited)	Gray	R192 G192 B192 #C0C0C0
Input Field, Checkbox, Radio Button Background (edits allowed)	White	R255 G255 B255 #FFFFFF
Input Field, Checkbox, Radio Button Background (edits prohibited)	Light Gray	R224 G224 B224 #E0E0E0
Dynamic Data Display Color	**Color Name**	**Definition**
Label Foreground	Dark Gray 63	R063 G063 B063 #3F3F3F
Engineering Unit Foreground	Light Gray 91	R145 G145 B145 #919191
Data Foreground	Blue	R071 G092 B167 #475CA7
Data Border (for diagrams only)	Light Gray	R192 G192 B192 # C0C0C0
Primary State Indicator Foreground	Blue	R071 G092 B167 #475CA7
Primary State Indicator Background	Light Gray	R212 G212 B212 #D4D4D4
Navigation Button	**Color Name**	**Definition**
Foreground (Fill)	Light Gray 198	R198 G198 B198 #C6C6C6
Border (Outline)	Gray 170	R170 G170 B170 #AAAAAA

Label	Dark Gray 63	R063 G063 B063 #3F3F3F

Piping Graphics

Process pipes will be represented by the 2D graphic "Line" Line width "2"

Element State Color	Color Name	Definition
2D Graphic Line	Black	R000 G000 B000 #000000

Structure Graphics

Structures will be represented by the 2D graphic "Line" Line width "1"

Element State Color	Color Name	Definition
Structure Lines	Dark Gray 63	R063 G063 B063 #3F3F3F

Common Standards HMI and OIT

Text Fonts and Colors

Static text for Equipment status if not part of a Faceplate labeling will be Arial 8 font,

Text Color Equipment Status	Light Gray 91	R150 G150 B150 #919191

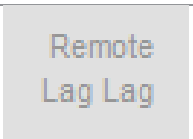


Figure 7 - Static Text for Equipment Status Example

Static text for Naming locations or Areas will be Arial Bold 8 font,

Text Color Locations/Areas	Black	R000 G000 B000 #000000

8 PanelView OIT Screen Design

The following section will describe the design parameters used for OIT development. The actual building blocks for the picture development can be found on the OIT system on the imported PlantPax Global Objects for PlantPax Library ver 4.1.

Note: To keep the OIT Application small use Direct Reference Tags and delete any unused Screens from the Application when completed. Panelviews have limited storage for Screens/Tags/Logging.

8.1 Screen Resolution

All PanelView nodes will use a screen resolution of 1024 x 768 15" or 1280 x 1024 for Wide Screen 19"

Level 1 PlantPAx Overview no control. First Screen to be displayed when application is started. (Home Screen)

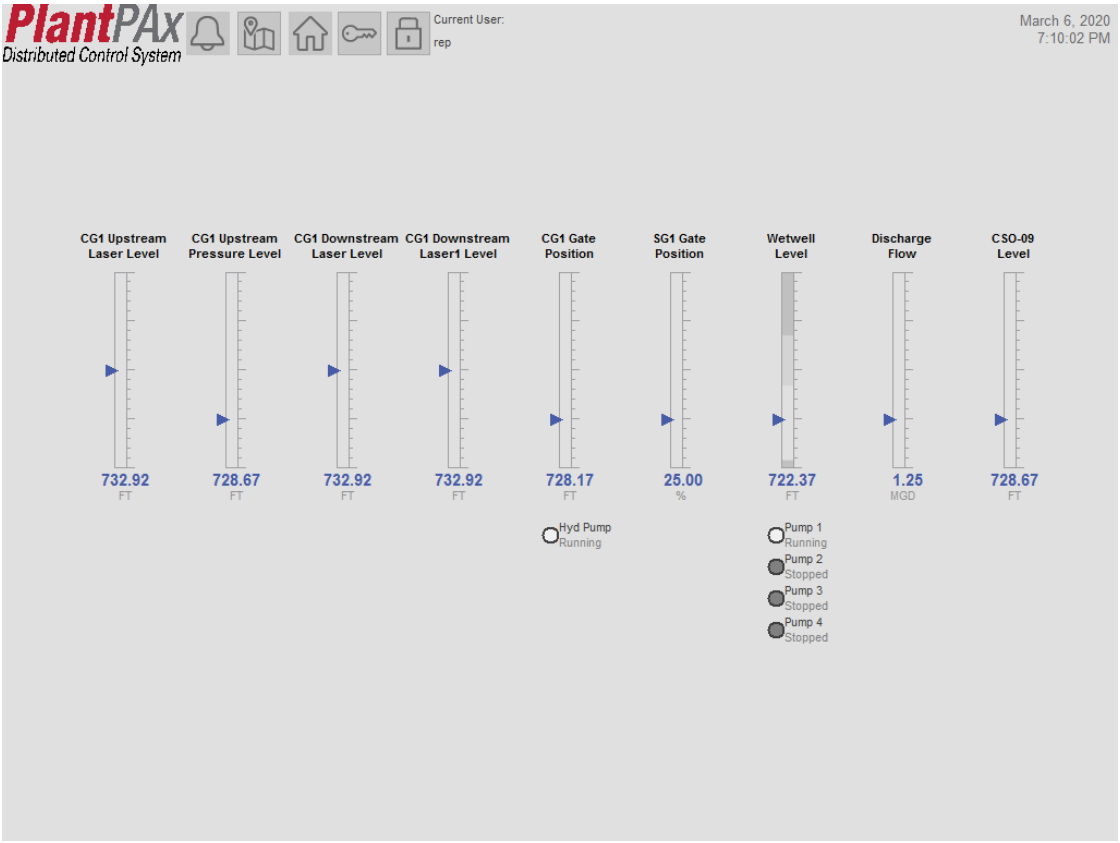


Figure 21 – Home Screen

Level 2, PlantPAx-Operations Control Screen and overview of the station. This screen has the ability for controlling the process through Faceplates. Touch one of the pump graphics and a Faceplate will appear. This Faceplate allows you to control the pump in Auto (Program) mode or Manual (Operator) mode. If the pumps are tied to an Alternator as Gooseneck Pump Station is then all the Program and Operator control will be done through the Alternator. The Pump Faceplates can still be opened for viewing Interlocks, Runtimes, Naming, etc.

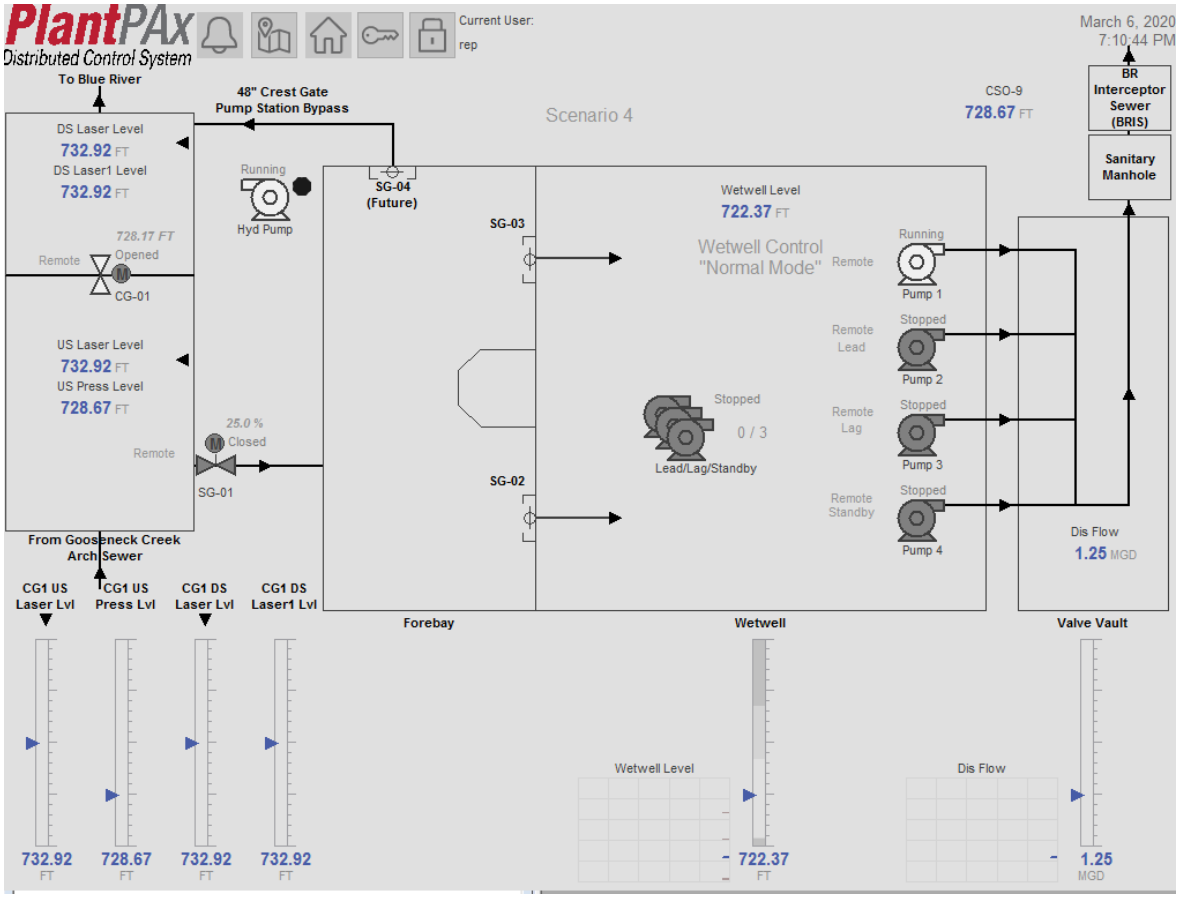
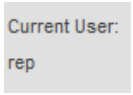


Figure 22 – Overview Screen

Title Bar for all screens, used for login in, opening the Display Navigation popup, navigate to the Alarm screen, shows who is logged in, and Date/Time.

1. "Alarm Navigation" Button Opens the Alarm Screen.
2. "Display Navigation" Button Opens a popup screen that has more Navigation buttons.
3. "Home Navigation" Button Opens the Home Screen or Overview Screen.
4. "Log In" Button Used to "Login" for accessing different levels of the process.
    a. Initial Login "User Name" will be, "admin"
    b. Initial Login "Password" will be, "Station Number"

Note: The Initial Login will be removed when a Network connection is made to a SCADA FTView SE system. The Login will then be from a Domain Controller Server "DC" using the Active Directory.

5. "Log Out" Button Used to "Log Out" the current user and automaticly Logs in a "Default" user with "View Only" credentials.
6. Current user 

shows what user is currently logged in.

Maintenance Screen for pulling up PDF Files/extras.

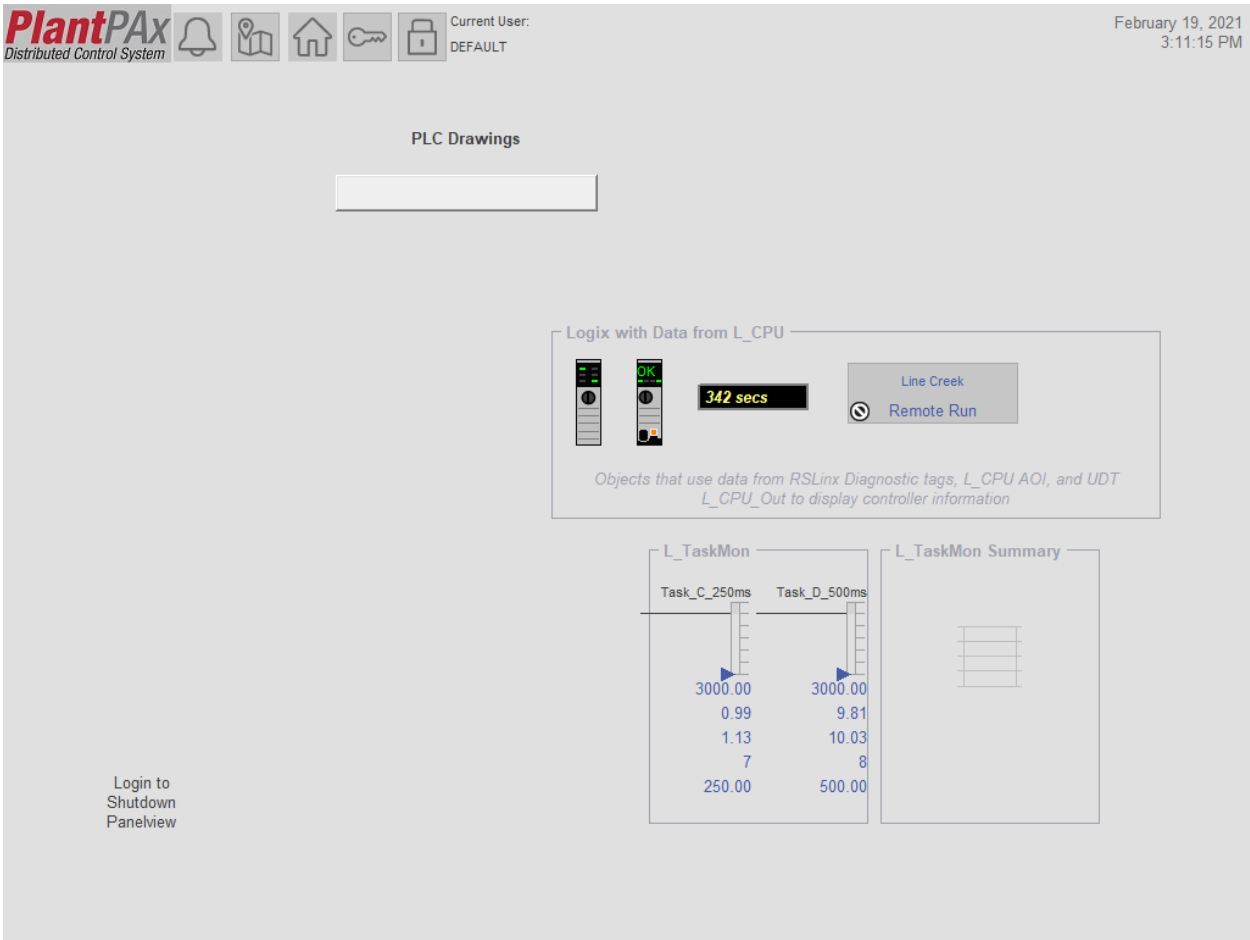


Figure 23 – Maintenance Screen

Setpoint Screen, there will be some controls that cannot be accomplished by PlantPax programming. These programs are added to the PlantPax programming in the PLC requiring Operator entered Setpoints to maintain the control process.

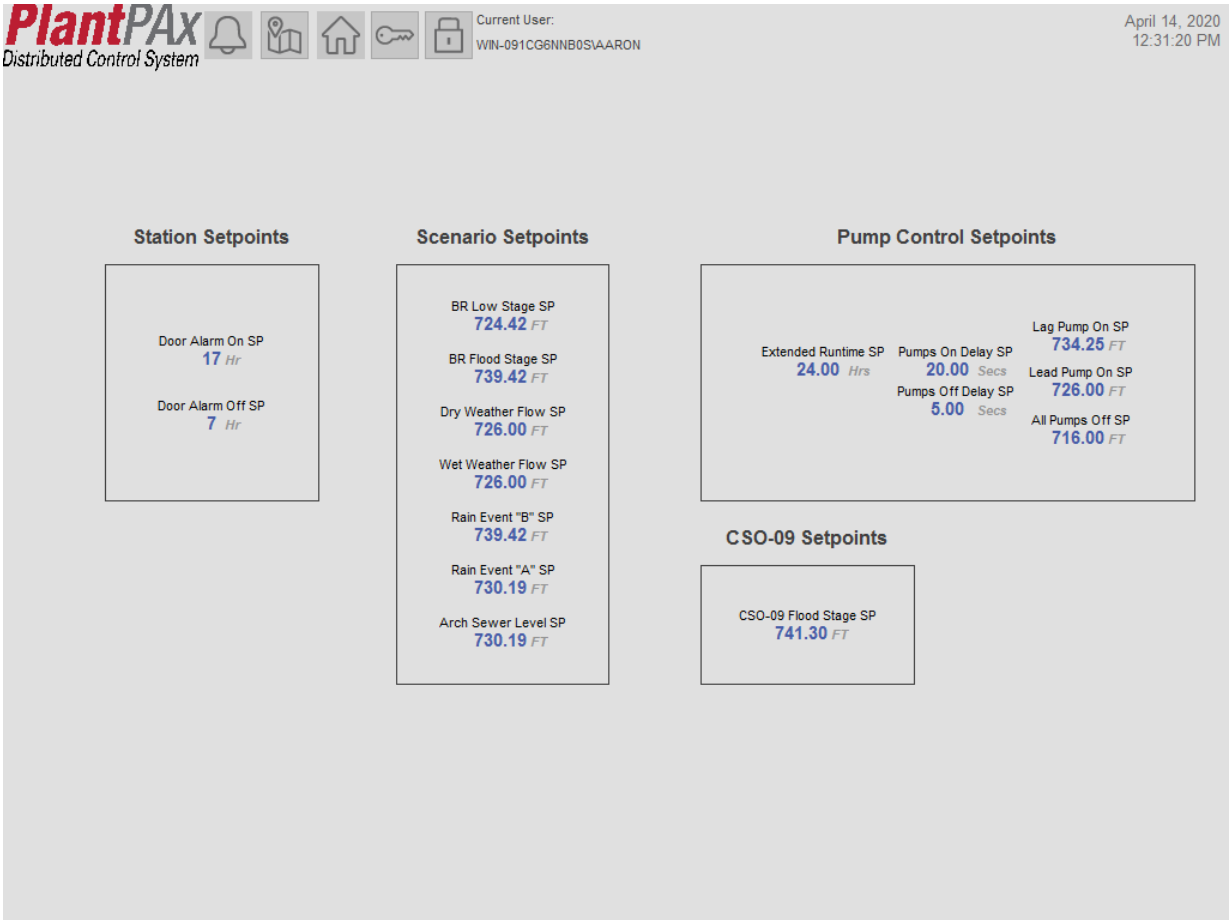


Figure 25 – Setpoints

Alarm Screen, The Alarm Screen is split into two sections,
1. Unacknowledged, Active and Inactive alarms that have not been acknowledged.
2. Acknowledged, Active and Inactive alarms that have been acknowledged.
When there is an Active alarm it is represented by the letter “A” on the left hand side of the Alarm Summary screen

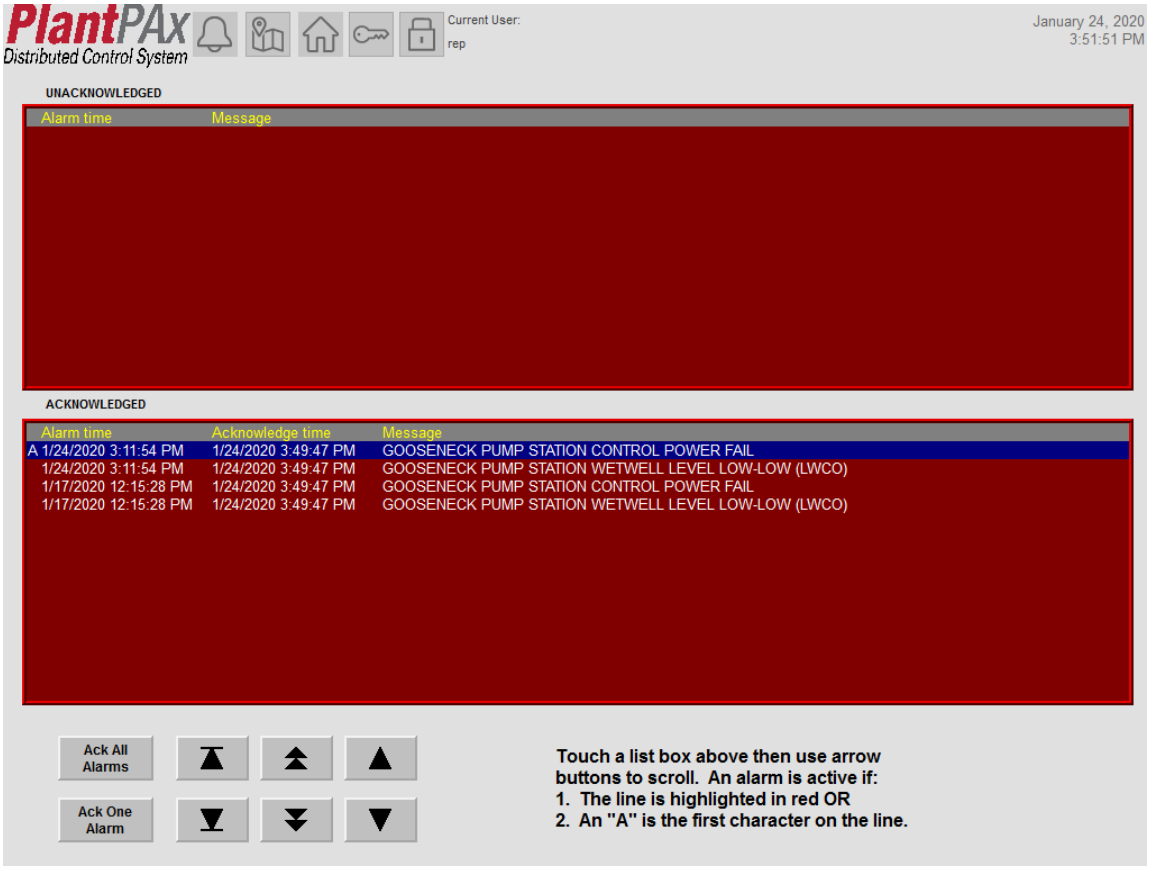
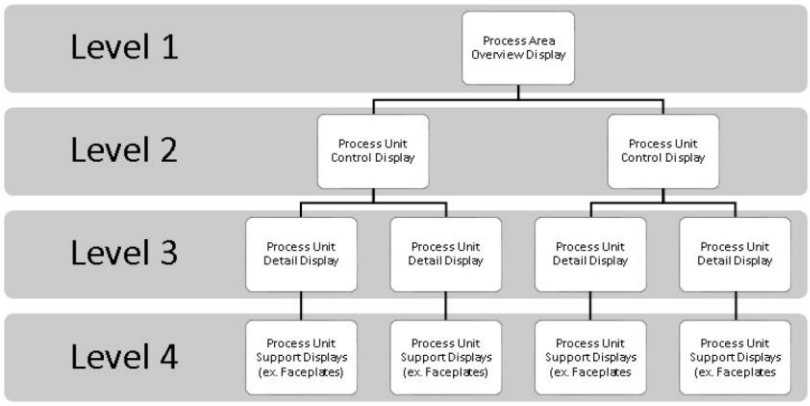


Figure 26 – Alarm Screen

9 Panelview OIT Display Levels

Understanding the users' goals, tasks, and mental model is crucial to determining the organization of the displays in an OIT project. They should be organized for the primary user as identified in user research. In most cases this is the operator. Secondary users need to be considered as well, but the information they need can be provided on separate displays or workstations.

The hierarchy and organization of the displays should be created to provide progressive disclosure of information. A clean, simple display with an overview of the operations should lead to other displays that contain more complexity and detail as users navigate deeper into the hierarchy. Using this methodology provides a quick look and allows the user to initiate the action of diving deeper for more information rather than having it clutter the initial display. There are four levels that are recommended for the display hierarchy, each level providing more detail than the previous level.



Level 1: Overview Display

Provides an overview of the operator's entire span of responsibility.

Level 2: Process Unit Control Display

Operator's primary operating display. Used during normal operations, routine changes, and monitoring.

Level 3: Process Unit Detail Display

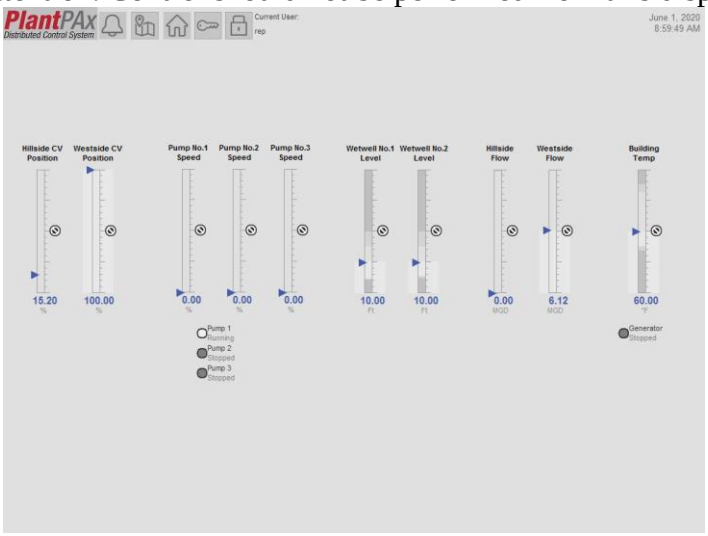
Non-routine operations. Provides sufficient information to facilitate process diagnostics.

Level 4: Process Unit Support Display

Interlocks, Diagnostics, Help, and Documentation; delivered on faceplates or popup displays.

9.1 Level 1 Displays: Process Overview

Level 1 displays contain high-level overview information that can be assimilated quickly, provide clear indication of current performance, and highlight anything that requires immediate attention. Control should not be performed from this display.



Example Level 1 display

Level 1 displays contain the following types of elements:

- High-level Key Performance Indicators (KPI)
- Alarms of top 2 or 3 highest priorities
- Important calculated parameters and conditions
- Important information from upstream and downstream units
- Advanced control mechanisms performance and status
- Major equipment status
- Appropriate trends of important parameters
- Indications of abnormal situations, denoting severity

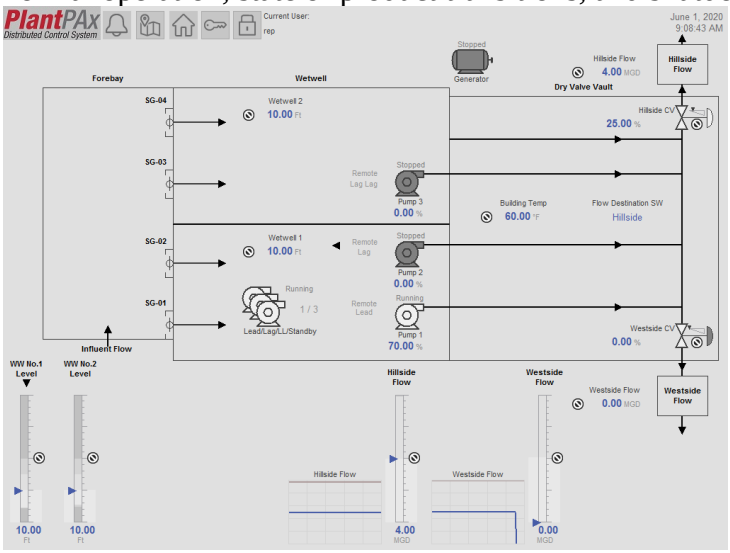
There should only be one overview display for a specific operating position; however, there may be different ones for different modes or process changes such as batch.

Level 1 displays are crucial as they provide contextual information; however, they may not contain all information users need to perform their jobs. Instead, they provide current state of operations, indications of abnormal situations that may be occurring, and quick and easy access to additional information.

Level 1 displays should be designed secondarily to Level 2 displays.

9.2 Level 2 Displays: Process Unit Operating Graphics

Level 2 displays are the primary displays used for operators to perform their tasks and should be designed first. Level 2 displays should match the users' mental model of the machine and operation and provide easy access to related displays in the display hierarchy. There may be multiple Level 2 displays for the same equipment to cover specific situations such as startup, normal operation, state or product transitions, and shutdown.



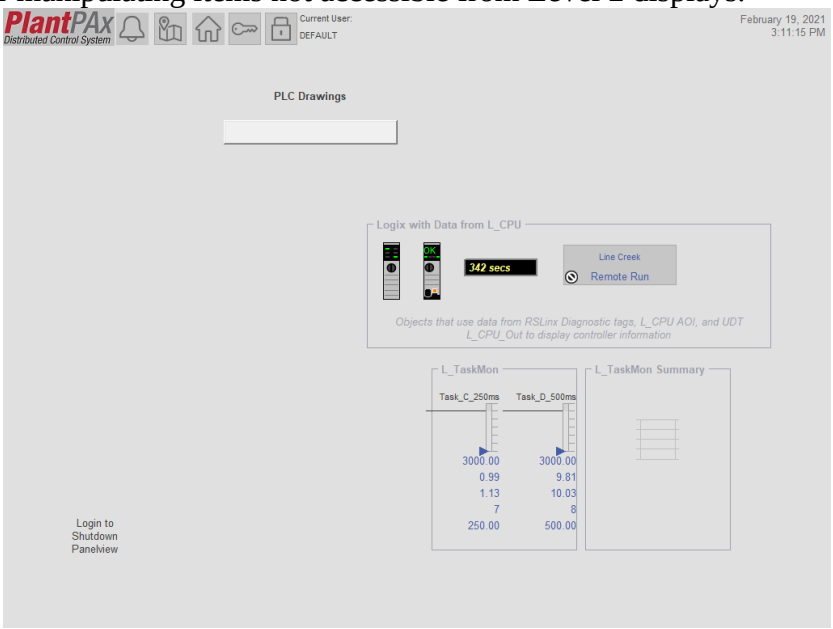
Example Level 2 display

Level 2 displays contain the following types of elements that are relevant to the tasks to be accomplished by that display:

- Key Performance Indicators (KPI)
- Controls needed to accomplish tasks (or access to controls, such as easy access to faceplates that contain controls)
- Indicators needed to accomplish tasks
- Navigation to related displays
- Navigation to overview display
- Indications of abnormal situations, denoting severity

9.3 Level 3 Displays: Process Detail Displays

Level 3 displays contain much more detail and controls. They contain detailed view of sub-units, individual equipment items, components, and their related controls and indications. They are used for detailed investigations and interventions and are intended primarily for troubleshooting or manipulating items not accessible from Level 2 displays.



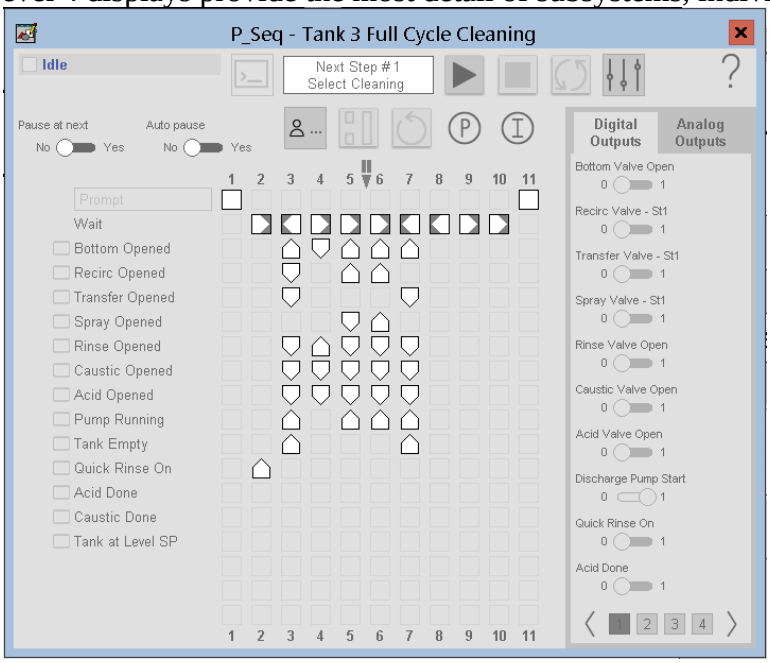
Example Level 3 display

Level 3 displays contain the following types of elements that are relevant to the tasks to be accomplished by that display:

- Alarms of all priorities relevant to that display
- Controls
- Indicators
- Detail view of equipment

9.4 Level 4 Displays: Process Support and Diagnostics Displays

Level 4 displays provide the most detail of subsystems, individual sensors, or components.



Example Level 4 display

Examples include:

- Alarm displays with details of individual sensor status
- Detailed info about equipment and instrumentation
- Detailed status of Advanced Process Control functionality
- System-supplied displays such as point detail, system diagnostics, alarm summary, etc.
- Help displays
- Operating procedures
- Alarm documentation and response guidance

Animated Graphics

Animated, or moving, graphics will not be used. Animated graphics generally do not provide meaningful information to an operator. Do not use spinning pumps, spinning mixers, bubbles, etc. All graphics will use color changes, as well as visibility on status words, to indicate status especially for the people that may not be able to perceive color changes.

General Color Conventions

The colors referenced in this document are based on those available with PlantPax software. Each main color is identified by a name and/or number designation based on the “System Default” color palette. Color and font selections should be consistent throughout all screens and pop-ups.

Display Background (no tabs)	Light Gray 224	R224 G224 B224 #E0E0E0
Notification Color Use	**Color Name**	**Definition**
Low Priority Alarm	Magenta	R145 G106 B173 #916AAD
Low Priority Alarm Foreground	White	R255 G255 B255 #FFFFFF
Medium Priority Alarm	Yellow	R245 G225 B027 #F5E11B
Medium Priority Alarm Foreground	Dark Gray 63	R063 G063 B063 #3F3F3F
High Priority Alarm	Orange	R236 G134 B041 #EC8629
High Priority Alarm Foreground	White	R255 G255 B255 #FFFFFF
Urgent Priority Alarm	Red	R226 G032 B040 #E22028
Element State Color	**Color Name**	**Definition**
Off/De-energized/Idle/Stopped/Closed	Gray	R128 G128 B128#808080
On/Energized/Running/Open	Off White	R240 G240 B240 #F0F0F0
Disabled/Out of Service	Gray	R128 G128 B128 #808080
Manual Operations (Jogging)	Light Blue	R147 G194 B228 #93C2E4
Transition (Starting, Stopping, Accelerating, Decelerating, Opening, Closing)	Light Blue	R147 G194 B228 #93C2E4

Piping Graphics

Process pipes will be represented by the 2D graphic “Line” Line width “2”

Element State Color	**Color Name**	**Definition**
2D Graphic Line	Black	R000 G000 B000 #000000

Structure Graphics

Structures will be represented by the 2D graphic “Line” Line width “1”

Element State Color	**Color Name**	**Definition**
Structure Lines	Dark Gray 63	R063 G063 B063 #3F3F3F

Common Standards HMI and OIT

Text Fonts and Colors

Static text for Equipment status if not part of a Faceplate labeling will be Arial 8 font,

Text Color Equipment Status	Light Gray 91	R150 G150 B150 #919191

Figure 7 - Static Text for Equipment Status Example

Static text for Naming locations or Areas will be Arial Bold 8 font,

Text Color Locations/Areas	Black	R000 G000 B000 #000000

Figure 8 - Static Text for Naming Locations or Areas Example

Navigation

Along with the Tool Bar, navigating from screen to screen can be done through process links on the HMI. As for the OIT a "Display Map" Screen will be used. These process links will provide the navigation from screen to screen where process is linked by piping. Provide a navigation link on both the current and the destination screen so that the user can easily navigate back and forth through screens on the same process.

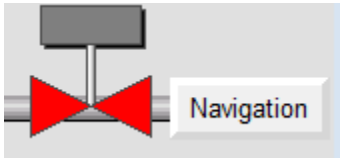


Figure 27 - Screen to Screen Navigation Example

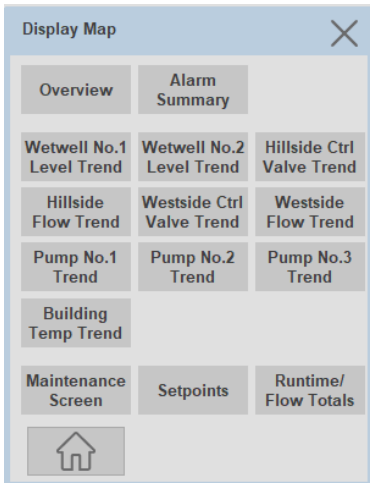


Figure 28 - Display Map Navigation Example

Analog Value Displays

Analog values, such as level and flow, are read from a field transmitter by a PLC. The Scaling will happen in the PLC per P_AIn AOI which will be setup from the Faceplate in either the HMI or OIT. Then the HMI will display the scaled value through a Global P_AIn object on a graphic

screen. All analog values should be displayed in a similar manner. Show the Global Object on the piping as required representing process flow through the system. Use (RA-BAS-ME) P_AIn Graphics Library.ggfx and (RA-FRAME-ME) P_AIn Graphics Library.ggfx Global Objects as the standard.

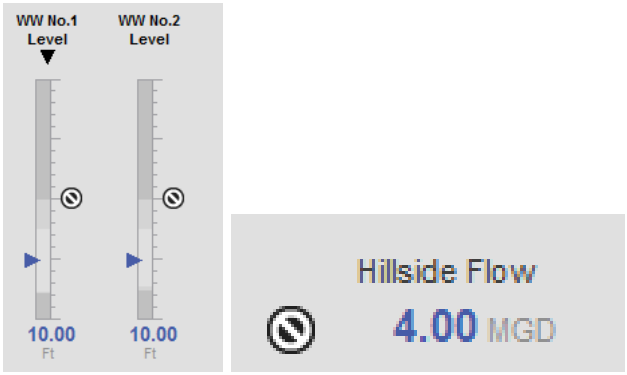


Figure 29 - Analog Value Display

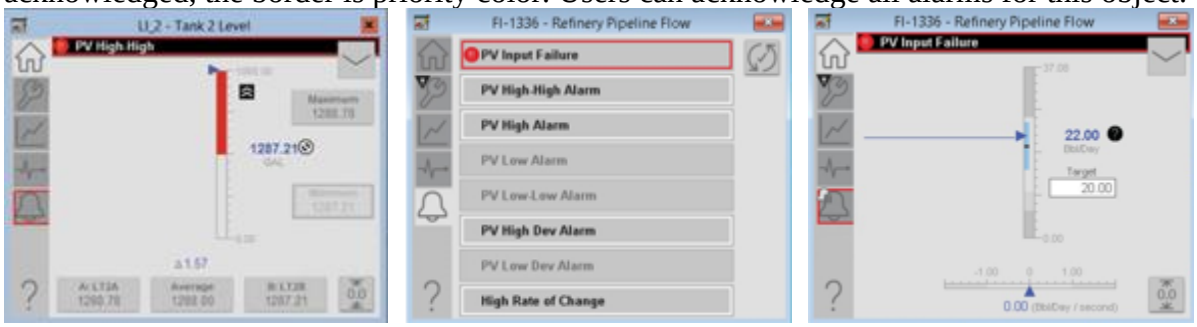
Analog Value Alarms

Analog values that need alarm setpoints will be programmed into the PLC respective AOI through the Faceplate.

Alarm Tab in Faceplate

The Alarm Tab displays the highest priority alarm. An urgent alarm is shown in the example below, resulting in a red border around the alarm tab. The tab also displays alarm state; for example, if users shelve an alarm, this is indicated on the alarm tab.

The alarm page in a faceplate lists all alarms. If an alarm is occurring, the display alarm icon and border become alarm color. If the alarm goes unacknowledged, then the border blinks. If acknowledged, the border is priority color. Users can acknowledge all alarms for this object.



Users can click on alarm from here to view more details and actions as seen below.

Figure 30 - Analog Setpoint Display

Analog Units

Flow can be in ###.# gpm
Or Flow in ##.# mgd
Flow totals in #,###,###.# gallons (resets to 0 after 9,999,999)

Flow totals in #,###,###.# gal x 1000 (resets to 0 after 9,999,999)
Flow totals in #,###,###.# mg (resets to 0 after 9,999,999)
Levels shown in feet from the floor ##.# ft
Pressure in ##.# psi
Speed in ###.# %
Position in ###.# %
Runtime in ###,###.# hrs (resets to 0 after 999,999.9)
Airflow #####.# scfm
MLSS ##.## mg/L
Sludge Density ###.## mg/L

Valves

All valves will be displayed with the same icon, regardless of actual likeness. Orientation of Valves will determine placement in processes.

Dynamic Valve objects use the following color scheme:

Element State Color	Color Name	Definition
Closed	Gray	R128 G128 B128 #808080
Open	Off White	R240 G240 B240 #F0F0F0
Stopped	Light Blue	R147 G194 B228 #93C2E4
Closing/Opening	Part Off White Part Gray	R240 G240 B240 #F0F0F0 R128 G128 B128 #808080

Variable position valve and open/close valves will look similar except the variable position valve will have an analog display that shows open position percentage. Global Object P_ValveC. Use (RA-BAS-ME) Process Graphics Library.ggfx Global Objects as the standard.

If the valve is controllable from the Plant Control System, selecting the valve icon will open the valve Faceplate.

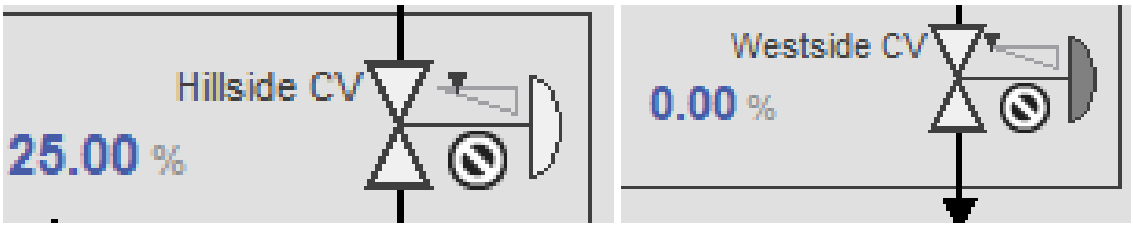


Figure 31- Typical Position Valve

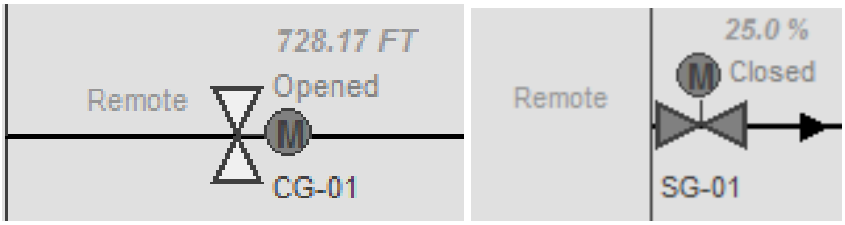


Figure 32 - Typical Open/Close Valve

Motors

All motors will be displayed with similar icons, regardless of actual likeness. Orientation of Motors will determine placement in processes.

Dynamic Motor objects use the following color scheme:

Element State Color	Color Name	Definition
Off/De-energized/Idle/Stopped	Gray	R128 G128 B128 #808080
On/Energized/Running	Off White	R240 G240 B240 #F0F0F0
Disabled/Out of Service	Gray	R128 G128 B128 #808080
Manual Operations (Jogging)	Light Blue	R147 G194 B228 #93C2E4
Transition: Starting, Stopping, Accelerating, Decelerating	Light Blue	R147 G194 B228 #93C2E4

Variable speed motor and constant speed motors will look similar except the variable position motor will have an analog display near displaying speed position percentage. Use (RA-BAS-ME) P_VSD Graphics Library.ggfx and (RA-BAS-ME) P_MotorHO Graphics Library.ggfx and (RA-BAS-ME) P_Motor Graphics Library.ggfx Global Objects as the standard.

If the motor is controllable from the Plant Control System, selecting the motor icon will open the motor Faceplate.

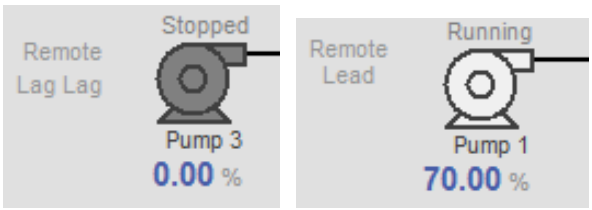


Figure 33 - Typical Variable Speed Motor (Pump)

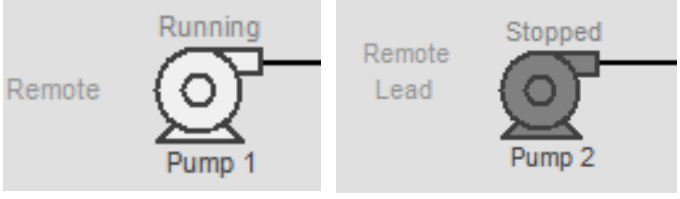


Figure 34 - Typical Constant Speed Motor (Mixer)

Operator Setpoint Entries

Operators will need to enter values into the plant control system if a Faceplate is not available. These setpoints could be for information, alarming, or control of equipment. All setpoint entries will be displayed on a Setpoint type screen. No setpoints will be able to be entered directly from the main screen area. Operator setpoint entries look similar to the analog value displays. Font will be Blue Arial Bold 11.

Data Foreground	Blue	R071 G092 B167 #475CA7

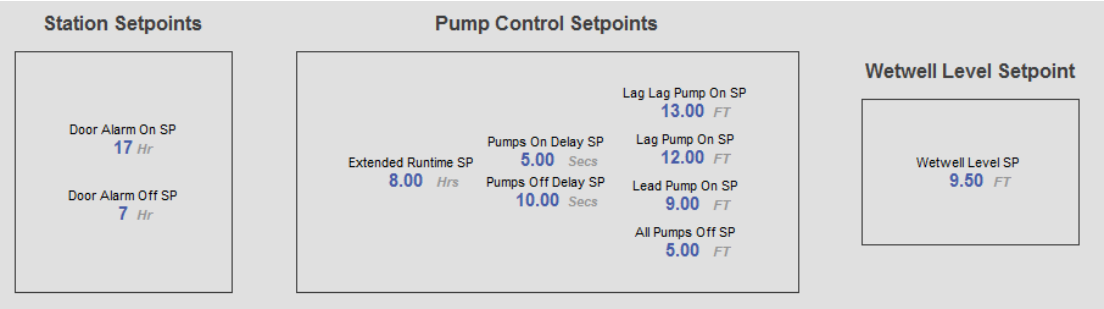
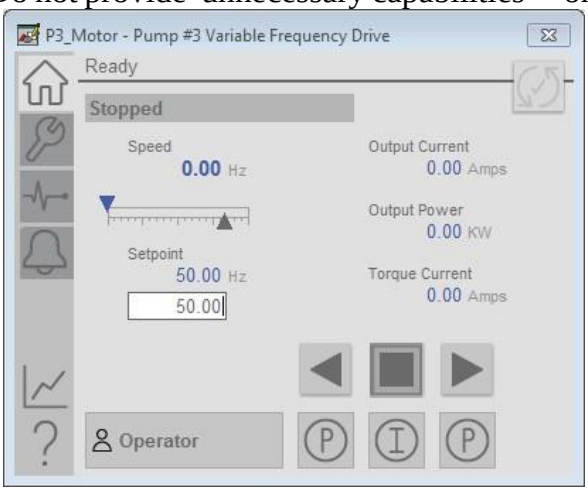


Figure 35 - Operator Setpoint Entries

Screen Control Faceplate

Faceplates are smaller "sub" screens that are called from a Global Object.
It is important to understand the users' goals and tasks to determine what controls are needed.
Do not provide unnecessary capabilities— only what is necessary for achieving the tasks.



Example of controls on faceplate

Ensure consistency across controls.

- Similar controls are to use same method for entering commands or information
- Use consistent wording
- Use consistent location of entry area and information
- Use consistent location of interface management controls (e.g., scroll bar, navigation). Minimize the demands upon users.
- Do not require users to remember special codes or sequence or perform translations or

conversions.

- Reduce what is required of the users and try to automate as much as possible. Beware when removing controls, as this can cause users to lose some aspects of situation awareness. This can be overcome by providing appropriate data and feedback.
- Ensure that the process of entering commands is logical.
- Support single method for input, as it is easier for users to stick with one method rather than jumping back and forth.
- Entry fields and controls need to be distinguishable from static text, so users do not have to hunt or question what is or is not a control.
- Consider providing default values where it makes sense.
- Do not require measurement of units to be entered.

Minimize potential errors.

- Allow ability to edit input before entering
- Important actions with significant consequence are to have confirmation mechanisms to avoid inadvertent activation
- Allow ability to have approval or confirmation

Level Indication

Tank levels shall be indicated by use of a Global Object P_AIn. This will assist an operator in determining the Level of a tank. The current level value shall be indicated along with proper Eng Units configured in the Faceplate. Use (RA-BAS-ME) P_AIn Graphics Library.ggfx and (RA-FRAME-ME) P_AIn Graphics Library.ggfx Global Objects as the standard.

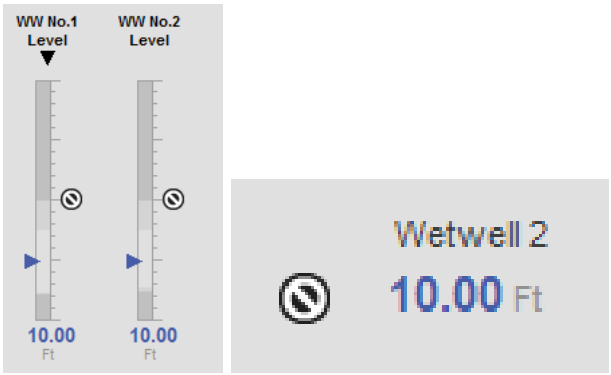


Figure 36 – Tank with Level Animation Example

Equipment Control

Control of the site processes will be programmed into the PLC's.
All controllable equipment that is programmed for manual operation, such as valves, pumps, etc., will have a Global Object with a Faceplate for operator control of available control, such as, Operator Off Program and speed adjustment. The Faceplate will open when an equipment symbol Global Object on the graphic display is selected. The Faceplate will be positioned so that the status information for the selected equipment will remain visible on the main screen, while the Faceplate is being used.

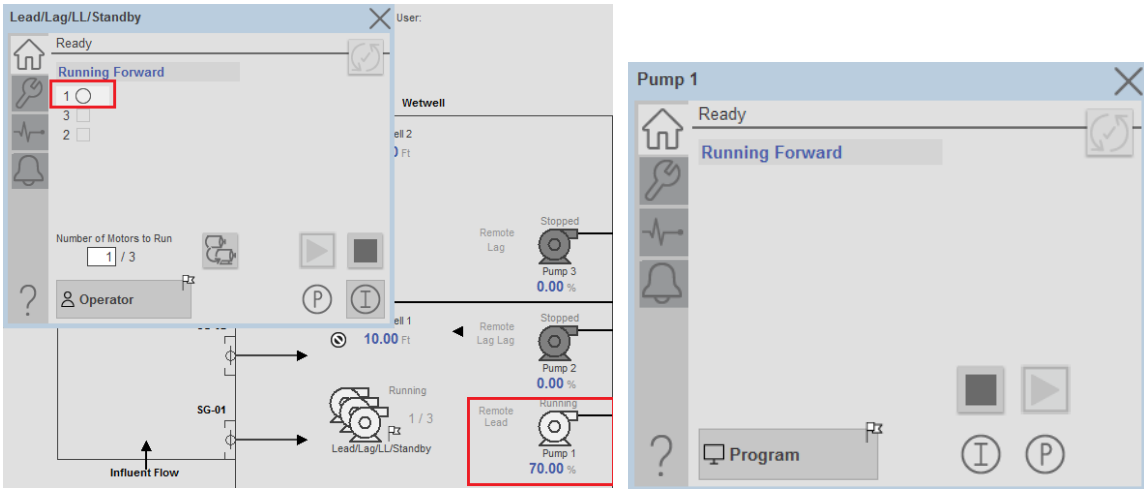


Figure 37 – Control Popup Location Example

Most systems will have multiple pumps that are controlled by an Alternator AOI (P_LLS). This Alternator Global Object will have control of pumps that are programmed in the PLC to be controlled by the Alternator. If this is the case then the Faceplate for each Pump does not have the ability to start and stop the pumps in Operator mode. You will have to use the Alternator Faceplate interface to start and stop pumps in Operator mode.

Data Retention File Backup Archive Standard

FTView SE Back Up

Using “FactoryTalk View SE Application Manager” for Distributed applications backup the Scada applications and save on the local hard drive and USB Flash Drive.
Also save the created Runtime Client on the local hard drive and USB Flash Drive.
Designate a Folder under the “C” drive as the Project folder (example: BlueRiver WWTP SCADA)

FTView ME Back Up

Use “Application Manager” for FTView ME applications backup the application and save on a USB Flash Drive.

Flash Drive Backup

Who:
Anyone changing a program

What:
All programs and configuration files need to be backed up. Back Up everything it would take to re-create the system.

When:
Save what you are working on every day to the ProjectFlashDrive. Sync it to the server at least weekly and when you’re finished working on it.

How:
Use Microsoft SyncToy to keep all folders updated. This can be downloaded at http://www.microsoft.com/en-us/download/confirmation.aspx?id=15155 On the ProjectFlashDrive maintain a folder for each location you are working on G:\MO\Kansas City\Wastewater_Project_Backup\Site\HMI
G:\MO\Kansas City\Wastewater_Project_Backup\Site\PLC
G:\MO\Kansas City\Wastewater_Project_Backup\Site\FILES
Set up a Folder Pair using the SyncToy Action Synchronize between the ProjectFlashDrive and the server. A common “_Project_Backup” folder structure is copied to each site location folder.
Backup copies of each file shall be designated with the file name and YEAR_MONTH_DAY.
Example: KCMO BlueRiver WWTP_2020_Jun_20.apa

Where:
Files shall be backed up on the Site Scada Server Eng Work Station, Project Flash Drive, and KCMO “ecads” folder on the KCMO Water Server.

Alarms/Events

Alarm/Events Tag Selection Spreadsheet example

Currently in the Alarm Data Base	Currently Historically Logged	Local Address	Tag Name	Description	Data Types	Alarm Logging "Yes"	Alarm Logging "No"	Historical Logging "Yes"	Historical Logging "No"
xxx	xxx	xxxxxx	xxxxxx	xxxxxxxxxx	xxxxx	xxx	xxx	xxx	xxx
Yes	Yes		AT_121_1	H2S Operating Floor Bar Screen Room Concentration					
Yes	Yes		AT_121_2	H2S Operating Floor Bar Screen Room Concentration					
Yes	Yes		AT_121_3	H2S Operating Floor Bar Screen Room Concentration					
Yes	Yes		AT_121_4	H2S Operating Floor Bar Screen Room Concentration					
Yes	Yes		AT_121_5	H2S Operating Floor Bar Screen Room Concentration					
Yes	Yes		AT_121_6	H2S East Blue Pump Floor Concentration					
Yes	Yes		AT_121_7	H2S Round Grove Pump Floor Concentration					
Yes	Yes		AT_121_8	H2S Operating Floor Concentration					
Yes	Yes		AT_131_1	LEL Operating Floor Bar Screen Room Concentration					
Yes	Yes		AT_131_2	LEL Operating Floor Bar Screen Room Concentration					
Yes	Yes		AT_131_3	LEL Operating Floor Bar Screen Room Concentration					
Yes	Yes		AT_131_4	LEL Operating Floor Bar Screen Room Concentration					
Yes	Yes		AT_131_5	LEL Operating Floor Bar Screen Room Concentration					
Yes	Yes		AT_131_6	LEL Header Floor Concentration					
Yes	Yes		AT_131_7	LEL Header Floor Concentration					
Yes	Yes		AT_131_8	LEL Operating Floor Concentration					
			BVC_221_1A	Pump 221 Discharge Valve Close Command	P_DOut				
			BVC_221_1B	Pump 221 Discharge Valve Emergency Close Command	P_DOut				
			BVC_231_1A	Pump 231 Discharge Valve Close Command	P_DOut				
			BVC_231_1B	Pump 231 Discharge Valve Emergency Close Command	P_DOut				
			BVO_221	Pump 221 Discharge Valve Open Command	P_DOut				
			BVO_231	Pump 231 Discharge Valve Open Command	P_DOut				
	Yes		EB_PROCESS_ELEV		REAL				
	Yes		EB_PROCESS_LEVEL		REAL				
	Yes		JI_BUS_1	SWGR-1 Kilo-Watts/Hr Bus-1	P_AIn				
	Yes		JI_BUS_2	SWGR-1 Kilo-Watts/Hr Bus-2	P_AIn				
			FCVC_213	Plug Valve 213 Close Command	P_DOut				
			FCVC_214	Plug Valve 214 Close Command	P_DOut				
			FCVC_223	Plug Valve 223 Close Command	P_DOut				
			FCVC_224	Plug Valve 224 Close Command	P_DOut				
			FCVC_233	Plug Valve 233 Close Command	P_DOut				
			FCVC_234	Plug Valve 234 Close Command	P_DOut				
			FCVC_243	Plug Valve 243 Close Command	P_DOut				
			FCVC_244	Plug Valve 244 Close Command	P_DOut				
			FCVC_253	Plug Valve 253 Close Command	P_DOut				
			FCVC_254	Plug Valve 254 Close Command	P_DOut				
			FCVO_213	Plug Valve 213 Open Command	P_DOut				
			FCVO_214	Plug Valve 214 Open Command	P_DOut				
			FCVO_223	Plug Valve 223 Open Command	P_DOut				
			FCVO_224	Plug Valve 224 Open Command	P_DOut				
			FCVO_233	Plug Valve 233 Open Command	P_DOut				
			FCVO_234	Plug Valve 234 Open Command	P_DOut				
			FCVO_243	Plug Valve 243 Open Command	P_DOut				
			FCVO_244	Plug Valve 244 Open Command	P_DOut				

Alarm/Events Severity Legend

Alarms Level Groups	Alarm Level Group Names	Severity Ranges

Group 1	Low Priority Alarm	Range 1-250
Group 2	Medium Priority Alarm	Range 251-500
Group 3	High Priority Alarm	Range 501-750
Group 4	Urgent Priority Alarm	Range 751-1000

Alarm/Events Severity Spreadsheet example

Alarm	Tag name	Alarm Description	Data Type	Severity	Notes
x	xxxx	xxxxxxxxxx	xxx	xxxx	
x	AT_121_1	H2S Bar Screen No.1 Channel High/High High	P_AIn	700=High, 1000=High High	
x	AT_121_2	H2S Bar Screen No.2 Channel High/High High	P_AIn	700=High, 1000=High High	
x	AT_121_3	H2S Bar Screen No.3 Channel High/High High	P_AIn	700=High, 1000=High High	
x	AT_121_4	H2S Bar Screen No.4 Channel High/High High	P_AIn	700=High, 1000=High High	
x	AT_121_5	H2S Bar Screen Room High/High High	P_AIn	700=High, 1000=High High	
x	AT_121_6	H2S East Blue Operating Floor Concentration High/High High	P_AIn	700=High, 1000=High High	
x	AT_121_7	H2S Round Grove Pump Floor Concentration High/High High	P_AIn	700=High, 1000=High High	
x	AT_121_8	H2S Pump Floor Concentration High/High High	P_AIn	700=High, 1000=High High	
x	AT_131_1	LEL Bar Screen No.1 Channel High/High High	P_AIn	700=High, 1000=High High	
x	AT_131_2	LEL Bar Screen No.2 Channel High/High High	P_AIn	700=High, 1000=High High	
x	AT_131_3	LEL Bar Screen No.3 Channel High/High High	P_AIn	700=High, 1000=High High	
x	AT_131_4	LEL Bar Screen No.4 Channel High/High High	P_AIn	700=High, 1000=High High	
x	AT_131_5	LEL Bar Screen Room High/High High	P_AIn	700=High, 1000=High High	
x	AT_131_6	LEL Operating Floor Concentration High/High High	P_AIn	700=High, 1000=High High	
x	AT_131_7	LEL Pump Floor Concentration High/High High	P_AIn	700=High, 1000=High High	
x	AT_131_8	LEL Pump Floor Concentration High/High High	P_AIn	700=High, 1000=High High	
x	BR_WWTP_Comms_Fault_AL	Blue River WWTP Radio Comms Fail	BOOL	750	
x	FIL_221	Pump 221 Seal Water Low Flow	P_DIn	350	
x	FIL_231	Pump 231 Seal Water Low Flow	P_DIn	350	
x	FIT_212	Pump 211 Discharge Flow High/Low	P_AIn	700=High, 350=Low	
x	FIT_222	Pump 221 Discharge Flow High/Low	P_AIn	700=High, 350=Low	
x	FIT_232	Pump 231 Discharge Flow High/Low	P_AIn	700=High, 350=Low	
x	FIT_242	Pump 241 Discharge Flow High/Low	P_AIn	700=High, 350=Low	
x	FIT_252	Pump 251 Discharge Flow High/Low	P_AIn	700=High, 350=Low	
x	LIT_161_1A	East Blue Wetwell Level No.1 Level Low/Low Low	P_AIn	350=Low, 450=Low Low	
x	LIT_161_1B	East Blue Wetwell Level No.2 Level Low/Low Low	P_AIn	350=Low, 450=Low Low	
x	LIT_161_2A	Round Grove Wetwell Level No.1 Low/Low Low	P_AIn	350=Low, 450=Low Low	
x	LIT_161_2B	Round Grove Wetwell Level No.2 Low/Low Low	P_AIn	350=Low, 450=Low Low	
x	LSHH_1	Sump Pit High High Alarm	P_DIn	1000	
x	LSHH_2	Pump Floor High High Alarm	P_DIn	1000	
x	LSH_101	EBWW Wetwell High Level Float	P_DIn	700	
x	LSH_201	RGWW Wetwell High Level Float	P_DIn	700	
x	LSLL211	VFD 211 Low Water Cut Off EBWW	P_DIn	450	
x	LSLL221	ECD 221 Low Water Cut Off EBWW	P_DIn	450	
x	LSLL231	ECD 231 Low Water Cut Off RGWW	P_DIn	450	
x	LSLL241	VFD 241 Low Water Cut Off RGWW	P_DIn	450	
x	LSLL251	VFD 251 Low Water Cut Off RGWW	P_DIn	450	
x	MT211	Pump 211 VFD fail to stop/fail to start	P_VSD	750	
x	MT221	Pump 221 VFD fail to stop/fail to start	P_VSD	750	
x	MT231	Pump 231 VFD fail to stop/fail to start	P_VSD	750	
x	MT241	Pump 241 VFD fail to stop/fail to start	P_VSD	750	
x	MT251	Pump 251 VFD fail to stop/fail to start	P_VSD	750	
x	PI_121	Pump Station Seal Water System Pressure High	P_AIn	700	
x	PI_210	Pump 211 Discharge Pressure High	P_AIn	700	

PLC Programming methods

PLC Programming will be a combination of Ladder and Function Block formats derived from the ACM.

Layout

Under the "Tasks" Folder only the following tasks will be used.

- Task_C_250ms
- Task_D_500ms
- _Controller_Status

Task_C_250ms, use is for all programs added that are not part of the ACM generated program. Example: Global Equipment Controls, Controls migrated from other PLCs, Alternators, First_Pass Routines, IO_Mapping, PLC to PLC Messages, etc.

Task_D_500ms, use is for all ACM generated programs and process/equipment driven controls. Example: Single Pump Control, DI, DO, AI, AO, Flows, Pressures, etc.

_Controller_Status, use is for monitoring and troubleshooting PLC through status of Tasks and PLC Processor functions. PLC Processor functions/status will be monitored through the appropriate AOI "L_CPU_24_Up".

Note: Delete all unused Tasks that were generated by the ACM.

PLC Memory Map (if used)

Controller Tags are used in PLC programming. Program Tags will not be used because the HMI will not be able to see them through the Communication network (They are not Global). Symbolic Tags with data type BOOL, REAL, and INT will be used.

PLC to PLC Comms using a Data Concentrator (DC) over Ethernet Radio

The main purpose of this section is to set standards for PLC to PLC data exchange for the Allen Bradley ControlLogix/Compact Logix PLC's on the KCMO Scada Ethernet network. This section provides information for PLC programmers to share data on the Ethernet network to be used by other PLC's in the event the Scada systems remote sites are communicating over Radios.

There are multiple PLC's located throughout the Kansas City Area and some will need to exchange data with each other over Radios. Since an HMI/OIT Global Object must connect directly to the PLC's AOI Radios does not have enough band width to exchange the data efficiently to maintain connectivity. For example, a Pump Station PLC Comms to a respective WWTP Scada system is over an Ethernet Radio. To resolve this issue there needs to be a Data Concentrator PLC (DC_PLC) designated for making the Produced/Consumed Tag Memory

Mapping. Rockwell has an example PLC code and an HMI application. Using this method, it will not be possible for Remote Control of Sites. Sites will be “Read” only.

PLC to PLC Communications

The main purpose of this section is to set standards for PLC to PLC data exchange for the Allen Bradley ControlLogix PLC’s on the Ethernet network at KCMO WWTPs. This section provides information for PLC programmers to share data on the Ethernet network to be used by other PLC’s. This section will not discuss the data exchange between PLC and HMI.

There are multiple PLC’s located throughout each WWTP and some will need to exchange data with each other. For example, a chemical feed PLC may need the plant flow value from another PLC to properly flow pace chemicals.

Data Transfer Method

Message Blocks are the way chosen to transfer data from Allen Bradley ControlLogix PLCs to other Allen Bradley ControlLogix or CompactLogix PLCs on the Ethernet network.

The PLCs that need the Data will Read the Data using a Message Block. The Logic will be written to produce a “Comm Fail” if the Message Block returns an Error. This Comm Fail will then Halt or Terminate the Process the data was intended for.

Data Transfer Addressing

PLCs that need Data and Produce Data will include Arrays to be read from by the Plant PLCs on the Ethernet network. Each PLC will allocate a memory Array of 100 registers for each data type. The name for these Arrays will be the same on each end (Plant PLC requesting Data and the PLC it's transferring with). See Table below for details.

Starting Address	Length	Description
PPP_DATA_READ_DIGITAL_INT[0]	**100**	**Facility Abbreviation Data Read Digital Integers**
PPP_DATA_READ_ANALOG_INT[0]	**100**	**Facility Abbreviation Data Read Analog Integers**
PPP_DATA_READ_REAL[0]	**100**	**Facility Abbreviation Data Read Floats**
BR_NEID_DATA_READ_DIGITAL_INT[0]	**100**	**Blue River WWTP NEID PS Data Read Digital Integers**
BR_NEID_DATA_READ_REAL[0]	**100**	**Blue River WWTP NEID PS Data Read Floats**

Table 15 - Data Exchange Address Allocation

Plant PLC Name	Area	Area PLC Names
P651PMPPLC01	**Pump Station**	**N/A**
P658PMPPLC01	**Pump Station**	**N/A**
P710DIGPLC01	**Digester**	**N/A**
P710DIGPLC02	**Transfer Area**	**N/A**
P658GRSCPLC01	**Screening**	**N/A**
P701PRIPLC01	**Sludge House**	**N/A**
P701PRIPLC02	**Sludge House**	**N/A**
P702BIOPLC01	**Sludge Collection**	**N/A**
P702DISPLC01	**Chemical System**	**N/A**
P620PMPPLC01	**Pump Station**	**N/A**
P702PMPPLC01	**Pump Station**	**N/A**

Table 16– Plant PLCs and Their Area PLCs

Ethernet MSG Configuration

Each Plant PLC that has Area PLCs will have a Message Block as needed, along with a Timer/Done/Error bit to step through the Message Blocks.

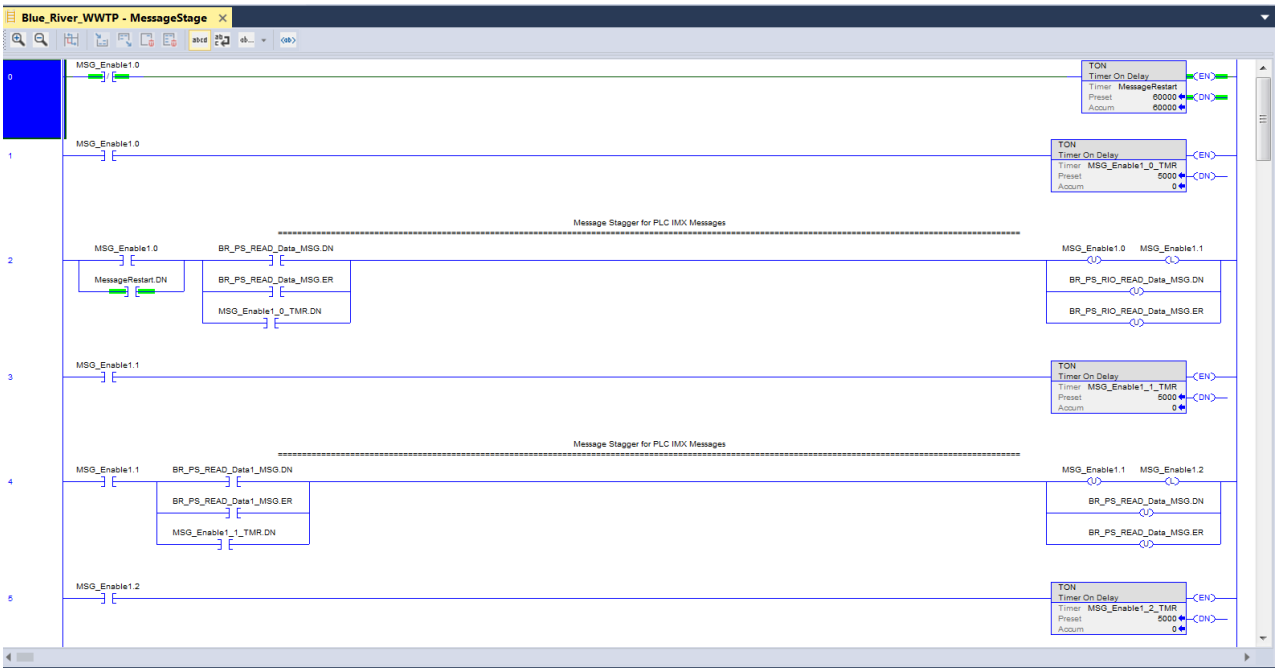


Figure 38 - Ethernet MSG Staging

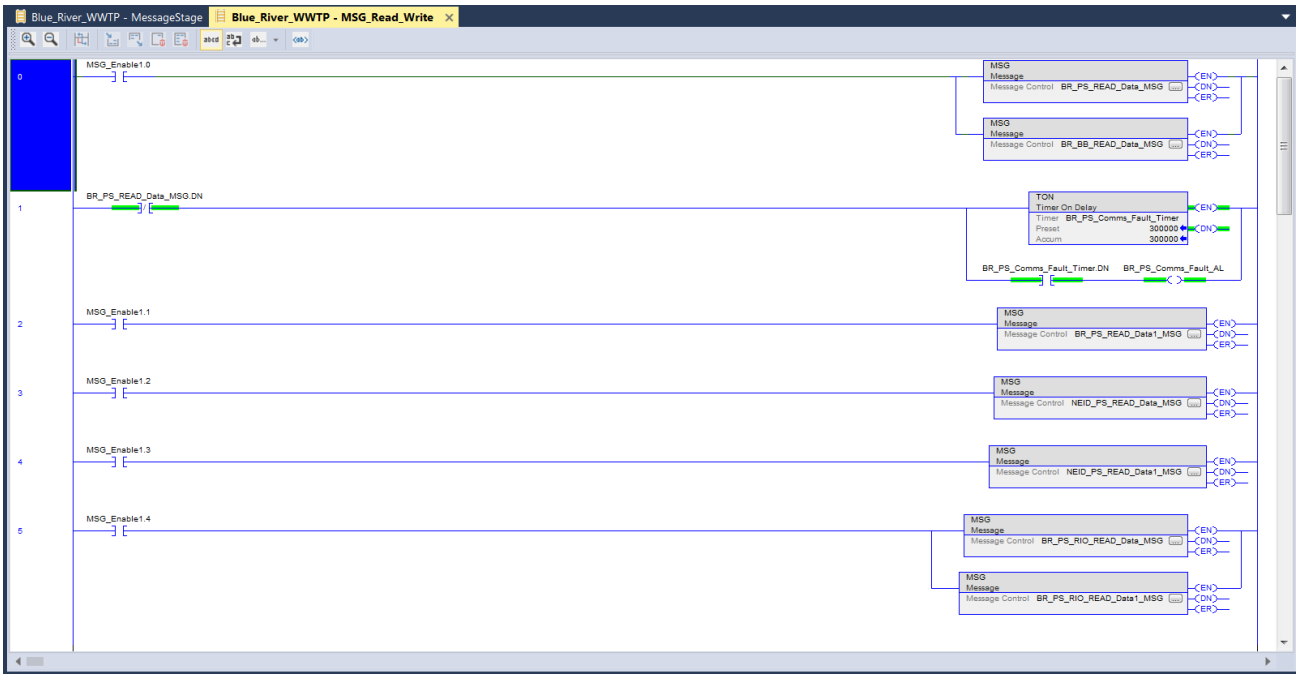


Figure 39 - Ethernet MSG Configuration

Data Transfer Format

The data transferred using the MSG must be in the following format.

The supplier of the PLC will maintain and provide a detailed list (including ranges) of the points it is providing to be Read and be used by other PLCs, included in the list will be the Data it needs from other PLCs.

Integer words (qty of 10 minimum) DATA_IN_PPP_PLC####_INT[0] thru [9] will be used for bits, starting at DATA_IN_PPP_PLC####_INT[0].0 and DATA_TO_PPP_PLC####_INT[0].0

Integers are used for Raw scaling (0-100%) values to and from each PLC. The Raw values are then inputs into each PlantPax Add On Instruction. In each AOI the Raw value is then scaled to the Engineering units for displaying on Scada Screens.

Tagname	Type	Range	Description
BR_NEID_DATA_READ_DIGITAL_INT[0].0	**Bool**		**Bar Screen 1 Run**
BR_NEID_DATA_READ_DIGITAL_INT[0]1	**Bool**		**Bar Screen 1 In Remote**
BR_NEID_DATA_READ_ DIGITAL_INT[0].2	**Bool**		**Bar Screen 1 Fail**
BR_NEID_DATA_READ_ DIGITAL_INT[0].3	**Bool**		**Bar Screen 1 High Level**
BR_NEID_DATA_READ_ DIGITAL_INT[0].4	**Bool**		**Bar Screen 1 Low Level**
BR_NEID_DATA_READ_ DIGITAL_INT[0].5	**Bool**		**Bar Screen 1 High Differential**
BR_NEID_DATA_READ_ DIGITAL_INT[0].6	**Bool**		
BR_NEID_DATA_READ_ DIGITAL_INT[0].7	**Bool**		
BR_NEID_DATA_READ_ DIGITAL_INT[0].8	**Bool**		
BR_NEID_DATA_READ_ DIGITAL_INT[0].9	**Bool**		
BR_NEID_DATA_READ_ DIGITAL_INT[0].10	**Bool**		
BR_NEID_DATA_READ_ DIGITAL_INT[0].11	**Bool**		
BR_NEID_DATA_READ_ DIGITAL_INT[0].12	**Bool**		
BR_NEID_DATA_READ_ DIGITAL_INT[0].13	**Bool**		
BR_NEID_DATA_READ_ DIGITAL_INT[0].14	**Bool**		
BR_NEID_DATA_READ_ DIGITAL_INT[0].15	**Bool**		
BR_NEID_DATA_READ_ DIGITAL_INT[1].0	**Bool**		
BR_NEID_DATA_READ_ DIGITAL_INT[1].1	**Bool**		
BR_NEID_DATA_READ_ANALOG_INT[0]	**Real**	**0-100%**	**Bar Screen 1 Channel Level**
BR_NEID_DATA_READ_ANALOG_INT [0]	**Real**	**0_100%**	**Bar Screen 1 Differential Pressure**
BR_PS_DATA_READ_DIGITAL_INT[0].0	**Bool**		**Channel 1 Enabled**
BR_PS_DATA_READ_DIGITAL_INT[0].1	**Bool**		**Gate 1 Open**
BR_PS_DATA_READ_ANALOG_INT[0]	**Real**	**0-100%**	**Influent Channel 1 Flow**
BR_PS_DATA_READ_ANALOG_INT[1]	**Real**	**0-100%**	**Gate 1 Position**

Table 17 - Data Transfer Worksheet Example

I/O and Control Loop Checkout Spreadsheet Example

I/O Checkout Spreadsheet Example

An I/O Checkout Spreadsheet is produced for keeping track of all I/O produced checked by Integrator/City/Engineers throughout the PLC upgrade process.

RACK	SLOT	CH.	I/O	Shortcut	Tag Name	Description	RANGE	UNITS	LOOP NO	Target	Measured on OIT MM/DD/YY	Measured on HMI MM/DD/YY	Unwitnessed FDT Pass MM/DD/YY	Witnessed FDT Pass MM/DD/YY	Unwitnessed SDT Pass MM/DD/YY	Witnessed SDT Pass MM/DD/YY	Unwitnessed SAT Pass MM/DD/YY	Witnessed SAT Pass MM/DD/YY
XXXX	X	X	XX	XXXXXXXXXX	XXXXXX	XXXXXXXXXXXXX	XXX	XX	XXXXXX									
1_2	2	0	DI	P669PMPPLC01	YL_101_1A	Slide Gate 101 HOA in Remote	n/a	n/a	GAT-101	On/Off								
1_2	2	1	DI	P669PMPPLC01	YL_101_1B	Slide Gate 101 HOA in Local	n/a	n/a	GAT-101	On/Off								
1_2	2	2	DI	P669PMPPLC01	ZSC_101	Slide Gate 101 Closed	n/a	n/a	GAT-101	On/Off								
1_2	2	3	DI	P669PMPPLC01	ZSO_101	Slide Gate 101 Opened	n/a	n/a	GAT-101	On/Off								
1_2	2	4	DI	P669PMPPLC01	YL_102_1A	Slide Gate 102 HOA in Remote	n/a	n/a	GAT-102	On/Off								
1_2	2	5	DI	P669PMPPLC01	YL_102_1B	Slide Gate 102 HOA in Local	n/a	n/a	GAT-102	On/Off								
1_2	2	6	DI	P669PMPPLC01	ZSC_102	Slide Gate 102 Closed	n/a	n/a	GAT-102	On/Off								
1_2	2	7	DI	P669PMPPLC01	ZSO_102	Slide Gate 102 Opened	n/a	n/a	GAT-102	On/Off								
1_2	2	8	DI	P669PMPPLC01	YL_105_1A	Slide Gate 105 HOA in Remote	n/a	n/a	GAT-105	On/Off								
1_2	2	9	DI	P669PMPPLC01	YL_105_1B	Slide Gate 105 HOA in Local	n/a	n/a	GAT-105	On/Off								
1_2	2	10	DI	P669PMPPLC01	ZSC_105	Slide Gate 105 Closed	n/a	n/a	GAT-105	On/Off								
1_2	2	11	DI	P669PMPPLC01	ZSO_105	Slide Gate 105 Opened	n/a	n/a	GAT-105	On/Off								
1_2	2	12	Di	P669PMPPLC01	YL_141_1A	Slide Gate 141 HOA in Remote	n/a	n/a	GAT-141	On/Off								
1_2	2	13	DI	P669PMPPLC01	YL_141_1B	Slide Gate 141 HOA in Local	n/a	n/a	GAT-141	On/Off								
1_2	2	14	DI	P669PMPPLC01	ZSC_141	Slide Gate 141 Closed	n/a	n/a	GAT-141	On/Off								
1_2	2	15	DI	P669PMPPLC01	ZSO_141	Slide Gate 141 Opened	n/a	n/a	GAT-141	On/Off								
1_2	3	0	DI	P669PMPPLC01	YL_142_1A	Slide Gate 142 HOA in Remote	n/a	n/a	GAT-142	On/Off								
1_2	3	1	DI	P669PMPPLC01	YL_142_1B	Slide Gate 142 HOA in Local	n/a	n/a	GAT-142	On/Off								
1_2	3	2	DI	P669PMPPLC01	ZSC_142	Slide Gate 142 Closed	n/a	n/a	GAT-142	On/Off								
1_2	3	3	DI	P669PMPPLC01	ZSO_142	Slide Gate 142 Opened	n/a	n/a	GAT-142	On/Off								
1_2	3	4	DI	P669PMPPLC01	YL_111_1A	Bar Screen 111 HOA in Remote	n/a	n/a	LCP-BSC-111	On/Off								
1_2	3	5	DI	P669PMPPLC01	YL_111_1B	Bar Screen 111 HOA in Local	n/a	n/a	LCP-BSC-111	On/Off								
1_2	3	6	DI	P669PMPPLC01	YL_111_1C	Bar Screen 111 Running	n/a	n/a	LCP-BSC-111	On/Off								
1_2	3	7	DI	P669PMPPLC01	YA_111	Bar Screen 111 Fail	n/a	n/a	LCP-BSC-111	On/Off								
1_2	3	8	DI	P669PMPPLC01	YL_112_1A	Bar Screen 112 HOA in Remote	n/a	n/a	LCP-BSC-112	On/Off								
1_2	3	9	DI	P669PMPPLC01	YL_112_1B	Bar Screen 112 HOA in Local	n/a	n/a	LCP-BSC-112	On/Off								
1_2	3	10	DI	P669PMPPLC01	YL_112_1C	Bar Screen 112 Running	n/a	n/a	LCP-BSC-112	On/Off								
1_2	3	11	DI	P669PMPPLC01	YA_112	Bar Screen 112 Fail	n/a	n/a	LCP-BSC-112	On/Off								
1_2	3	12	Di	P669PMPPLC01	YL_UPS_1	PLC UPS Ok	n/a	n/a	UPS-EB-1	On/Off								
1_2	3	13	DI	P669PMPPLC01	YA_UPS_1A	PLC UPS Fail	n/a	n/a	UPS-EB-1	On/Off								
1_2	3	14	DI	P669PMPPLC01	YA_UPS_1B	PLC UPS Battery Fail	n/a	n/a	UPS-EB-1	On/Off								
1_2	3	15	DI	P669PMPPLC01	YA_UPS_1C	PLC UPS Battery Warning	n/a	n/a	UPS-EB-1	On/Off								
1_2	4	0	DI	P669PMPPLC01	YL_103_1A	Slide Gate 103 HOA in Remote	n/a	n/a	GAT-103	On/Off								
1_2	4	1	DI	P669PMPPLC01	YL_103_1B	Slide Gate 103 HOA in Local	n/a	n/a	GAT-103	On/Off								
1_2	4	2	DI	P669PMPPLC01	ZSC_103	Slide Gate 103 Closed	n/a	n/a	GAT-103	On/Off								
1_2	4	3	DI	P669PMPPLC01	ZSO_103	Slide Gate 103 Opened	n/a	n/a	GAT-103	On/Off								
1_2	4	4	DI	P669PMPPLC01	YL_104_1A	Slide Gate 104 HOA in Remote	n/a	n/a	GAT-104	On/Off								
1_2	4	5	DI	P669PMPPLC01	YL_104_1B	Slide Gate 104 HOA in Local	n/a	n/a	GAT-104	On/Off								
1_2	4	6	DI	P669PMPPLC01	ZSC_104	Slide Gate 104 Closed	n/a	n/a	GAT-104	On/Off								

Control Loop Checkout Spreadsheet Example

A Control Loop Checkout Spreadsheet is produced for keeping track of any Control Loops produced checked by Integrator/City/Engineers throughout the PLC upgrade process.

TAG	LOOP Number	DESCRIPTION	RANGE	UNITS	P&ID REF	SPEC REF	Result	Measured on OIT MM/DD/YY	Measured on HMI MM/DD/YY	Unwitnessed FDT Pass MM/DD/YY	Witnessed FDT Pass MM/DD/YY	Unwitnessed SDT Pass MM/DD/YY	Witnessed SDT Pass MM/DD/YY	Unwitnessed SAT Pass MM/DD/YY	Witnessed SAT Pass MM/DD/YY
XXXX	_XX	XXXXXXXXXXXXX	XXX	XX	X-XX	XXXXX									
GAT	101	Round Grove Gate 101 Remote Manual Mode			I-3 and I-4	16916 pg18	Open								
GAT	101	Round Grove Gate 101 Remote Manual Mode			I-3 and I-4	16916 pg18									
GAT	101	Round Grove Gate 101 Remote Manual Mode			I-3 and I-4	16916 pg18	Close								
GAT	101	Round Grove Gate 101 Alarms			I-3 and I-4	16916 pg18	Alarm Indicators								
GAT	101	Round Grove Gate 101 Status Indicators			I-3 and I-4	16916 pg18	Status Indicators								
GAT	101	Round Grove Gate 101 HMI Requirements			I-3 and I-4	16916 pg18	HMI Requirements								
GAT	102	Round Grove Gate 102 Remote Manual Mode			I-3 and I-4	16916 pg18	Open								
GAT	102	Round Grove Gate 102 Remote Manual Mode			I-3 and I-4	16916 pg18									
GAT	102	Round Grove Gate 102 Remote Manual Mode			I-3 and I-4	16916 pg18	Close								
GAT	102	Round Grove Gate 102 Alarms			I-3 and I-4	16916 pg18	Alarm Indicators								
GAT	102	Round Grove Gate 102 Status Indicators			I-3 and I-4	16916 pg18	Status Indicators								
GAT	102	Round Grove Gate 102 HMI Requirements			I-3 and I-4	16916 pg18	HMI Requirements								
GAT	103	Round Grove Gate 103 Remote Manual Mode			I-3 and I-4	16916 pg22	Open								
GAT	103	Round Grove Gate 103 Remote Manual Mode			I-3 and I-4	16916 pg22									
GAT	103	Round Grove Gate 103 Remote Manual Mode			I-3 and I-4	16916 pg22	Close								
GAT	103	Round Grove Gate 103 Alarms			I-3 and I-4	16916 pg22	Alarm Indicators								
GAT	103	Round Grove Gate 103 Status Indicators			I-3 and I-4	16916 pg22	Status Indicators								
GAT	103	Round Grove Gate 103 HMI Requirements			I-3 and I-4	16916 pg22	HMI Requirements								
GAT	104	Round Grove Gate 104 Remote Manual Mode			I-3 and I-4	16916 pg22	Open								
GAT	104	Round Grove Gate 104 Remote Manual Mode			I-3 and I-4	16916 pg22									
GAT	104	Round Grove Gate 104 Remote Manual Mode			I-3 and I-4	16916 pg22	Close								
GAT	104	Round Grove Gate 104 Alarms			I-3 and I-4	16916 pg22	Alarm Indicators								
GAT	104	Round Grove Gate 104 Status Indicators			I-3 and I-4	16916 pg22	Status Indicators								
GAT	104	Round Grove Gate 104 HMI Requirements			I-3 and I-4	16916 pg22	HMI Requirements								
GAT	105	Round Grove Gate 105 Remote Manual Mode			I-3 and I-4	16916 pg18	Open								
GAT	105	Round Grove Gate 105 Remote Manual Mode			I-3 and I-4	16916 pg18									
GAT	105	Round Grove Gate 105 Remote Manual Mode			I-3 and I-4	16916 pg18	Close								

Instrument Device Schedule - Legend/Description Sheet

Type. This is the ISA (or similar) alpha tag representing the function of the instrument.
Loop Number. This is the numeric (or alphanmeric) loop designation for the instrument.
Service Description. This is the description of the instrument service (i.e. Filter No. 1 Loss-of-Head).
Device Type and Size. This is the instrument device type and should match the description as listed in the specification. A size is given if applicable (e.g., flow meters)
Size. Element size for flow applications or size as required by specialized instruments
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 FIELD-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 '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.
Drawing Name. This is the drawing number of the P&ID where the device is shown.
Specification. The provider for the specification section listed is responsible for supplying the device.
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 device

Item	Type	Loop Number	Tag	Service Description	Device Type	Size	Output_Type	Output_Range	Power_Type	DWG Number	Specification	Remarks
1	SE	021210	SE-021210	SOUTH CULVERT VELOCITY SENSOR	RADAR VELOCITY SENSOR	N/A	4-20mA	+/- 29.53 ft/sec	2-WIRE	I-10-701	13562	
2	SIT	021210	SIT-021210	SOUTH CULVERT VELOCITY TRANSMITTER	RADAR VELOCITY FLOW TRANSMITTER	N/A	4-20mA	Multiple	4-WIRE	I-10-701	13562	Refer to 13550 for analog ranges for flow, level, and velocity
3	LE	021210	LE-021210	SOUTH CULVERT LEVEL SENSOR	RADAR LEVEL SENSOR	N/A	4-20mA	0-20 ft	2-WIRE	I-10-701	13562	
4	ZE	021210	ZE-021210	SOUTH CULVERT BENDING WEIR INCLINOMETER	INCLINOMETER	N/A	4-20mA	0-90 degrees	2-WIRE	I-10-701	15121	
5	FE	021110	FE-021110	ROCK BOX RECIRCULATION SYSTEM FLOW	MAGNETIC FLOWMETER	4"	N/A	N/A	N/A	I-20-701	13562	
6	FIT	021110	FIT-021110	ROCK BOX RECIRCULATION SYSTEM FLOW	MAGNETIC FLOWMETER TRANSMITTER	N/A	4-20mA	0-700 GPM	4-WIRE	I-20-701	13562	
7	PIT	021110	PIT-021110	ROCK BOX RECIRCULATION SYSTEM IN-LINE GRINDER INLET PRESSURE	PRESSURE TRANSMITTER	N/A	4-20mA	0-25 PSI	2-WIRE	I-20-701	13563	
8	PI	021110	PI-021110	ROCK BOX RECIRCULATION SYSTEM IN-LINE GRINDER INLET PRESSURE	FIELD-MOUNTED PROCESS INDICATOR	N/A	4-20mA	0-25 PSI	2-WIRE	I-20-701	13563	
9	PIT	021111	PIT-021111	ROCK BOX RECIRCULATION SYSTEM IN-LINE GRINDER OUTLET PRESSURE	PRESSURE TRANSMITTER	N/A	4-20mA	0-25 PSI	2-WIRE	I-20-701	13563	
10	PI	021111	PI-021111	ROCK BOX RECIRCULATION SYSTEM IN-LINE GRINDER OUTLET PRESSURE	FIELD-MOUNTED PROCESS INDICATOR	N/A	4-20mA	0-25 PSI	2-WIRE	I-20-701	13563	

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.

B. The existing remote input-output (RIO) panel shall be modified to add a new analog input module (Allen-Bradley #1756-IF8I, without exception) and a new discrete input module (Allen-Bradley #1756-IA16IK, without exception), including any necessary additional wiring and hardware.

C. 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.

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. Acceptable Manufacturers

1. The PLC components shall be Allen-Bradley, without exception.

C. Signal Power Supplies

1. Regulated dc power supplies shall be provided in each PLC enclosure for analog 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. Output voltage regulation shall be as required by the instrumentation equipment supplied under another section.

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.

2.2 PROGRAMMING DEVICE HARDWARE

A. The programming device shall be a portable laptop computer as specified. System Supplier shall provide two interconnecting cables, each 5 meters long, to connect the computer to the programmable logic controller. The cables shall be shielded data cable and shall be terminated on both ends with the appropriate connectors. Connectors shall be labeled to identify the connected equipment.

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.

End of Section

13530A

Input/Output List - Legend/Description Sheet

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, Ethernet/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, 24VDC, 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	Drawing	Remarks
1	AI	SI	021210	SOUTH CULVERT FLOW VELOCITY	SIT-021210	P661RIOCP01	4-20mA	+/- 29.53 ft/sec	4-WIRE	N/A	N/A	N/A	N/A	I-10-701	
2	AI	LI	021210	SOUTH CULVERT LEVEL	SIT-021210	P661RIOCP01	4-20mA	EL 724.48 ft - EL 742.52 ft	4-WIRE	N/A	N/A	N/A	N/A	I-10-701	
3	AI	FI	021210	SOUTH CULVERT FLOW	SIT-021210	P661RIOCP01	4-20mA	+/- 250 MGD	4-WIRE	N/A	N/A	N/A	N/A	I-10-701	
4	AI	ZI	021210	SOUTH CULVERT BENDING WEIR INCLINE ANGLE	ZE-021210	P661RIOCP01	4-20mA	0-90 DEGREES	2-WIRE	N/A	N/A	N/A	N/A	I-10-701	
5	AI	FI	021110	ROCK BOX RECIRCULATION SYSTEM FLOW	FIT-021110	P661RIOCP01	4-20mA	0-700 GPM	4-WIRE	N/A	N/A	N/A	N/A	I-20-701	
6	AI	PI	021110	ROCK BOX RECIRCULATION SYSTEM GRINDER INLET PRESSURE	PI-021110	P661RIOCP01	4-20mA	0-25 PSI	2-WIRE	N/A	N/A	N/A	N/A	I-20-701	
7	AI	PI	021111	ROCK BOX RECIRCULATION SYSTEM GRINDER OUTLET PRESSURE	PI-021110	P661RIOCP01	4-20mA	0-25 PSI	2-WIRE	N/A	N/A	N/A	N/A	I-20-701	
8	AI	ZI	021110	ROCK BOX RECIRCULATION SYSTEM CONTROL VALVE POSITION INDICATION	ACTU-021110	P661RIOCP01	4-20mA	0-100%	4-WIRE	N/A	N/A	N/A	N/A	I-20-701	
9	AO	ZC	021110	ROCK BOX RECIRCULATION SYSTEM CONTROL VALVE POSITION COMMAND	ACTU-021110	P661RIOCP01	4-20mA	0-100%	4-WIRE	N/A	N/A	N/A	N/A	I-20-701	
10	DI	UA	021110	ROCK BOX RECIRCULATION SYSTEM CONTROL VALVE FAULT	ACTU-021110	P661RIOCP01	N/A	N/A	N/A	120VAC	NO FAULT	PLC	NO	I-20-701	
11	DI	YI	021110A	ROCK BOX RECIRCULATION SYSTEM CONTROL VALVE IN LOCAL	ACTU-021110	P661RIOCP01	N/A	N/A	N/A	120VAC	IN LOCAL	PLC	NO	I-20-701	
12	DI	YI	021110B	ROCK BOX RECIRCULATION SYSTEM CONTROL VALVE IN REMOTE	ACTU-021110	P661RIOCP01	N/A	N/A	N/A	120VAC	IN REMOTE	PLC	NO	I-20-701	
13	DI	ZIC	021110	ROCK BOX RECIRCULATION SYSTEM CONTROL VALVE CLOSED	ACTU-021110	P661RIOCP01	N/A	N/A	N/A	120VAC	CLOSED	PLC	NO	I-20-701	
14	DI	YIR	021110	ROCK BOX RECIRCULATION SYSTEM GRINDER RUNNING	CP-021110	P661RIOCP01	N/A	N/A	N/A	120VAC	RUNNING	PLC	NO	I-20-701	
15	DI	XA	021110	ROCK BOX RECIRCULATION SYSTEM GRINDER FAIL	CP-021110	P661RIOCP01	N/A	N/A	N/A	120VAC	NO FAULT	PLC	NO	I-20-701	
16	DO	UCR	021110	ROCK BOX RECIRCULATION SYSTEM GRINDER RUN COMMAND	CP-021110	P661RIOCP01	N/A	N/A	N/A	120VAC	RUN CMD	PLC	YES	I-20-701	

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.

B. Control System

1. The Instrumentation and Control System section shall apply to all systems described in this section.

1.2 SUBMITTALS

A. See Section 13500 – Instrumentation and Control System

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 on the field 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. 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.

G. 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 section 13500 Appendix A. As a minimum, each database point shall be provided with a tag name, engineering unit, alarm parameters, and description.

H. 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.

3.2 HMI FUNCTIONAL REQUIREMENTS

A. The following paragraphs describe general configuration tasks that are required for the HMI and related software.

B. Database

1. The system database, including field I/O and internal points shall be modified according to section 13500 Appendix A. Database generation for field I/O shall include all required coordination with PLC level addresses.

2. In the default scheme, the format of the tag name is XXX-YYY-ZA.

a. XXX is the ISA function designation.
b. YYY-ZA is the unique loop designation defined by the P&IDs.

3. Where possible YYY-ZA will correspond to the loop numbers on the P&IDs. Otherwise, a unique number shall be assigned. Z is a number (1, 2, 3) to designate similar loops associated with trains of equipment. A is a letter (A, B, C) to designate identical functions within the same loop. For instance, if there are two ferric sulfate metering pumps and the loop number chosen is 222, the remote status input for pump number one might be HS-222-1 and the remote status input for pump number two might be HS-222-2. If there is more than one switch input for either pump the tag name would be HS-222-1A and the second switch would be HS-222-1B.

4. Function designations currently defined are listed below:

a. AIs (Analog Inputs)
   1) AIT – Analytical Input
   2) EIT – Voltage Input
   3) EIIT – VAR Input
   4) FIT – Flow Input
   5) IIT – Current Input
   6) JIT – Power Input
   7) LIT – Level Input
   8) PDIT – Differential Pressure Input (Headloss)
   9) PIT – Pressure Input
   10) ST – Speed or Rate Input
   11) TIT – Temperature Input
   12) WIT – Weight Input
   13) ZT – Position Input

b. AOs
   1) AC – Residual Proportioning Control
   2) FC – Flow Proportioning Control
   3) SC – Speed or Rate Control
   4) ZC – Position Control

c. DIs
   1) AAH – Analytic Alarm High
   2) AAL – Analytic Alarm Low
   3) FSH – High Flow Status
   4) FSL – Low Flow Status
   5) HS – Hand Switch Status
   6) JA – Electrical Alarm
   7) LSH – High Level Status
   8) LSHH – High Water Cutoff Alarm
   9) LSL – Low Level Status
   10) LSLL – Low Water Cutoff Alarm
   11) PDSH – High Differential Status
   12) PS – Pressure Alarm Hi/Lo or Unspecified
   13) PSL – Low Pressure Status
   14) PSLL – Low Pressure Cutoff Alarm

15) WAL – Low Weight Alarm
16) XA – General or Unspecified Alarm
17) YA – Equipment Overload Alarm (Failure)
18) YS – Equipment Run Status
19) ZSC – Position Closed Status
20) ZSO – Position Open Status

d. DOs
1) LC – PLC Generated LWCO Output
2) XC – General Control Output
3) YC – Equipment Start/Stop Command
4) ZCC – Equipment Close Command
5) ZCO – Equipment Open Command

5. Initially, the facility database shall be configured so all database points are defined as belonging to a specific area (as allowed by the graphical interface software). The areas designated for the facility shall be coordinated with City. If City has no existing standards for area designations, all points can be placed in appropriate areas selected by System Supplier.

C. Trend Displays

1. Trend displays shall be developed to present real-time and historical process data in an X-Y graph format. Real-time trends shall utilize current process values to generate temporary graphs that do not retain data values. Historical trends shall utilize historically collected data and shall access the data files directly for use in the trend display. Historical trends shall allow paging forward and back to the limits of the collected data. The trending package shall be configured to automatically retrieve historical data from the proper data file to accommodate the paging functions. Content of the trends will be determined after meeting with City. 2 real-time trend displays and 2 historical trend displays shall be provided.

D. Alarms

1. Complete system alarming shall be configured. This shall include configuration of graphical alarm displays, and configuration of audible alarms through the HMI speakers. All process or system alarms shall appear on an alarm summary screen and the alarm banner of each process graphic. Alarms and events shall be color coded on the alarm summary screen, with initial colors based on City conventions or the default colors associated with the graphics package. The colors may be adjusted after meeting with City. Alarm prioritizing and area assignments (if any) shall be coordinated with City at the first configuration meeting.

2. For LOW or LOW-LOW analog or discrete alarms which do not apply if associated equipment is not operating, provisions shall be made to prevent/Lock generation of the alarm unless the associated equipment is operating. This shall include alarms such as low amperage alarms for pumps that are not running. This may also include low flows or pressures when associated pumps are not operating (this will only apply if periodic operation of the equipment is considered normal).

3. All alarms/events shall be time stamped when displayed or printed. Unacknowledged alarms shall not automatically clear from the alarm summary if they return to normal before being acknowledged.

E. Reporting

1. System reporting shall be accomplished using the standard operator interface software-reporting package. All necessary report development, including macro development in spreadsheets, shall be supplied to access real-time and historical data for reporting. 1 historical, monthly facility reports shall be provided.

F. Historical Data Collection

1. System data shall be collected for historical archiving and for use in trending and reporting functions. Requirements for data collection shall be as needed to support the trends and reports developed.

3.3 EQUIPMENT CONTROL AND CONTROL MODE OVERVIEW

A. The following paragraphs explain the general format and control modes that are used in the detailed equipment descriptions. These paragraphs apply to the attached, project specific, equipment control descriptions included herein.

B. General

1. Appended to this section are the equipment control programming requirements, with requirements for both PLC programming and the minimum operator interface functions. The HMI requirements represent the anticipated display generation requirements and shall be adjusted if the PLC programming warrants adjustment.

C. Control Modes

1. There are two general control modes available for the process equipment: 1) remote manual, and 2) remote auto. Remote manual control provides a means for operators to adjust equipment status or setpoint, through the HMI, using manually initiated commands. Remote automatic control provides a means for automatically changing equipment status or setpoint based on measured process parameters, calculated values, or operator setpoints. Some equipment may have more than one remote auto mode.

2. Descriptions for local control are included in the detailed equipment control descriptions. They are provided primarily for documentation purposes and for information. These controls are hardwired and require no programming effort.

3.4 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.

B. South Culvert Miscellaneous Measurements

New instrumentation shall be integrated into the existing control logic for monitoring and alarming purposes only:

Loop Components:
Velocity Sensor: SE-021210
Level Sensor: LE-021210
Velocity/Level/Flow Transmitter: SIT-021210
Inclinometer: ZE-021210

Associated PLCs:
Existing RIO Panel P661RIOCP01: OK Creek In-Line Storage Remote I/O Panel

Equipment Control Modes:
Local Manual Mode
None

Local Auto Mode
None

Remote Manual Mode
None

Remote Auto Mode
None

Setpoints and Ranges:
Level: 0-20 ft
Velocity: +/- 29.53 ft/sec
Flow: 0 - 250 MGD
Bending Weir Incline: 0-90°

Trending:
Level
Velocity
Flow
Bending Weir Incline

Alarms:
High Velocity – set by Operator

Power Failure:
Upon Power Failure, all equipment will resume operation.

HMI Requirements:
Level, velocity, and flow measurements and alarm annunciations shall be added to the existing HMI screen(s).

C. Rock Box Recirculation System

New instrumentation shall control spray into the North Rock Box.

Loop Components:
Flow Meter/Transmitter: FE/FIT-021110
Pressure Transmitters with Remote Display: PIT/PI-021110, PIT/PI-021111
In-Line Grinder: GRD-021110, CP-021110
Modulating Valve: VLV-021110, ACTU-021110

Associated PLCs:
Existing RIO Panel P661RIOCP01: OK Creek In-Line Storage Remote I/O Panel

Equipment Control Modes:

Local Manual Mode:
Local Manual control of the valve shall be provided at the actuator when the LOCAL-OFF-REMOTE (LOR) selector switch is in the LOCAL position. The operator shall use the OPEN-STOP-CLOSE controls at the actuator to control the valve.

Local Manual control of the in-line grinder shall be provided at the equipment control panel when the OOR selector switch is in the ON or OFF position.

Local Auto Mode:
None

Remote Manual Mode:
Remote Manual control of the in-line grinder shall be through the PLC when the OOR selector switch at the equipment control panel is in the REMOTE position and Manual is selected at the HMI. The operator shall be able to remotely start and stop the grinder from the HMI.

Remote Manual control of the valve shall be provided through the PLC when the LOR switch at the actuator is in the REMOTE position and Manual is selected at the HMI. The operator shall have OPEN-STOP-CLOSE and POSITION SETPOINT commands at the HMI to control the valve.

Remote Auto Mode:
Remote Auto control of the in-line grinder shall be through the PLC when the OOR selector switch at the equipment control panel is in the REMOTE position and AUTO is selected at the SCADA HMI. The PLC shall start the grinder when at least one existing Turkey Creek Pump Station (TCPS) effluent pump is running, and stop the grinder when all existing TCPS effluent pumps are stopped.

Remote Auto control of the valve shall be provided through the PLC. When the LOR switch at the actuator is in the REMOTE position and AUTO is selected at the SCADA HMI, the grinder is running, and the existing TCPS pump(s) are running, the PLC shall automatically control the valve position using PID control with the nozzle flow rate as the process setpoint, using an adjustable deadband, initially set at 3%) to prevent the valve from moving constantly. The PLC shall close the valve when no pumps are running. The PLC shall close the valve when the grinder is not running.

Setpoints and Ranges:

Flow: 0-700 GPM
Pressure: 0-25 PSI

Trending:
Flow
Pressure (for each pressure transmitter)
Grinder Runtime

Alarms:
High Pressure – optional, set by Operator
Grinder Fault

Power Failure:
Upon Power Failure, all equipment will resume operation.

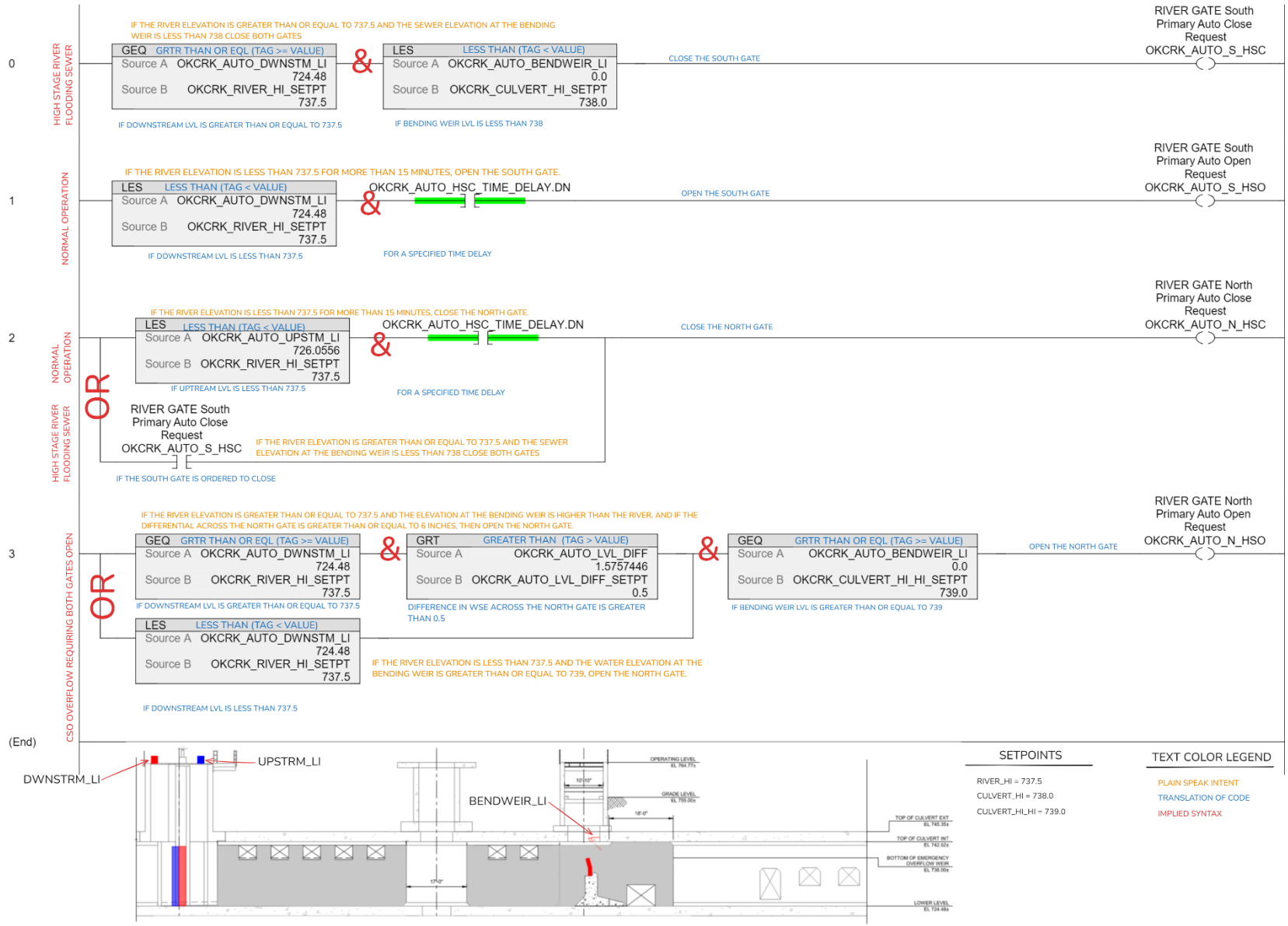
HMI Requirements:
The Rock Box Spray System shall be added to the existing HMI screen(s). Displays shall be provided similar to the P&ID. The valve and grinder symbols shall be selectable targets which retrieves the respective overlay display. The overlay display shall contain control targets which allow selection of control mode (auto/manual) and manual control.

D. Modifications to Existing Control Logic

Primary Local Control Panel for the gate control shall be according to the scenarios described below.

- Scenario 1: Dry Weather Flow with Kansas River at Low Stage.
  - When the downstream water level in either culvert is less than the operator setpoint for River High Level (initially set to EL 737.5') for a specified time delay, the South Gate will open, and the North Gate will close.
- Scenario 2: Wet Weather Flow with Kansas River at Low Stage.
  - When the downstream water level in either culvert is less than the operator setpoint for River High Level (initially set to EL 737.5') and the level upstream of the Bending Weir is greater than or equal to the operator setpoint for Culvert High High Level (initially set to EL 739.0'), the North Gate will open.
- Scenario 3: Wet Weather Flow with Kansas River at High Stage.
  - When the downstream water level in either culvert is greater than or equal to the operator setpoint for River High Level (initially set to EL 737.5') and the level upstream of the Bending Weir is greater than or equal to the operator setpoint for Culvert High High Level (initially set to EL 739.0') and the water level measured by the North Culvert Level Transmitter is at least 6-inches higher than the water level measured by either of the downstream level transmitters, the North Gate will open.
- Scenario 4: Kansas River Flooding
  - When the downstream water level in either culvert is greater than or equal to the operator setpoint for River High Level (initially set to EL 737.5') and the level upstream of the Bending Weir is less than EL 738 (note: this is not an adjustable setpoint), both the North and the South Gate will close.

End of Section


0
HIGH STAGE RIVER FLOODING SEWER
IF THE RIVER ELEVATION IS GREATER THAN OR EQUAL TO 737.5 AND THE SEWER ELEVATION AT THE BENDING WEIR IS LESS THAN 738 CLOSE BOTH GATES
GEQ GRTR THAN OR EQL (TAG >= VALUE)
Source A OKCRK_AUTO_DWNSTM_LI 724.48
Source B OKCRK_RIVER_HI_SETPT 737.5
IF DOWNSTREAM LVL IS GREATER THAN OR EQUAL TO 737.5
&
LES LESS THAN (TAG < VALUE)
Source A OKCRK_AUTO_BENDWEIR_LI 0.0
Source B OKCRK_CULVERT_HI_SETPT 738.0
IF BENDING WEIR LVL IS LESS THAN 738
CLOSE THE SOUTH GATE
RIVER GATE South Primary Auto Close Request OKCRK_AUTO_S_HSC
1
NORMAL OPERATION
IF THE RIVER ELEVATION IS LESS THAN 737.5 FOR MORE THAN 15 MINUTES, OPEN THE SOUTH GATE.
LES LESS THAN (TAG < VALUE)
Source A OKCRK_AUTO_DWNSTM_LI 724.48
Source B OKCRK_RIVER_HI_SETPT 737.5
IF DOWNSTREAM LVL IS LESS THAN 737.5
&
OKCRK_AUTO_HSC_TIME_DELAY.DN
FOR A SPECIFIED TIME DELAY
OPEN THE SOUTH GATE
RIVER GATE South Primary Auto Open Request OKCRK_AUTO_S_HSO
2
NORMAL OPERATION
HIGH STAGE RIVER FLOODING SEWER
IF THE RIVER ELEVATION IS LESS THAN 737.5 FOR MORE THAN 15 MINUTES, CLOSE THE NORTH GATE.
LES LESS THAN (TAG < VALUE)
Source A OKCRK_AUTO_UPSTM_LI 726.0556
Source B OKCRK_RIVER_HI_SETPT 737.5
IF UPTREAM LVL IS LESS THAN 737.5
&
OKCRK_AUTO_HSC_TIME_DELAY.DN
FOR A SPECIFIED TIME DELAY
CLOSE THE NORTH GATE
RIVER GATE North Primary Auto Close Request OKCRK_AUTO_N_HSC
OR
RIVER GATE South Primary Auto Close Request OKCRK_AUTO_S_HSC
IF THE SOUTH GATE IS ORDERED TO CLOSE
IF THE RIVER ELEVATION IS GREATER THAN OR EQUAL TO 737.5 AND THE SEWER ELEVATION AT THE BENDING WEIR IS LESS THAN 738 CLOSE BOTH GATES
3
CSO OVERFLOW REQUIRING BOTH GATES OPEN
IF THE RIVER ELEVATION IS GREATER THAN OR EQUAL TO 737.5 AND THE ELEVATION AT THE BENDING WEIR IS HIGHER THAN THE RIVER, AND IF THE DIFFERENTIAL ACROSS THE NORTH GATE IS GREATER THAN OR EQUAL TO 6 INCHES, THEN OPEN THE NORTH GATE.
GEQ GRTR THAN OR EQL (TAG >= VALUE)
Source A OKCRK_AUTO_DWNSTM_LI 724.48
Source B OKCRK_RIVER_HI_SETPT 737.5
IF DOWNSTREAM LVL IS GREATER THAN OR EQUAL TO 737.5
&
GRT GREATER THAN (TAG > VALUE)
Source A OKCRK_AUTO_LVL_DIFF 1.5757446
Source B OKCRK_AUTO_LVL_DIFF_SETPT 0.5
DIFFERENCE IN WSE ACROSS THE NORTH GATE IS GREATER THAN 0.5
&
GEQ GRTR THAN OR EQL (TAG >= VALUE)
Source A OKCRK_AUTO_BENDWEIR_LI 0.0
Source B OKCRK_CULVERT_HI_HI_SETPT 739.0
IF BENDING WEIR LVL IS GREATER THAN OR EQUAL TO 739
OPEN THE NORTH GATE
RIVER GATE North Primary Auto Open Request OKCRK_AUTO_N_HSO
OR
LES LESS THAN (TAG < VALUE)
Source A OKCRK_AUTO_DWNSTM_LI 724.48
Source B OKCRK_RIVER_HI_SETPT 737.5
IF DOWNSTREAM LVL IS LESS THAN 737.5
IF THE RIVER ELEVATION IS LESS THAN 737.5 AND THE WATER ELEVATION AT THE BENDING WEIR IS GREATER THAN OR EQUAL TO 739, OPEN THE NORTH GATE.
(End)
DWNSTRM_LI
UPSTRM_LI
BENDWEIR_LI
SETPOINTS
RIVER_HI = 737.5
CULVERT_HI = 738.0
CULVERT_HI_HI = 739.0
TEXT COLOR LEGEND
PLAIN SPEAK INTENT
TRANSLATION OF CODE
IMPLIED SYNTAX

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 Instrumentation and 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 Section 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 City 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 City 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 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 obstructionless, 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. Where indicated on the Drawings or in the Instrument Device Schedule, the meter shall be suitable for use in a Class I, Division 2, hazardous area.
    e. The meter shall include 316 stainless steel grounding rings.
    f. 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 3 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. 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.

B. Non-Contact Radar Velocity Flow Meters

1. Non-contact radar velocity flow meters shall have a radar velocity-sensing transducer and a radar level sensing transducer that are mounted inside the culvert shaft to measure flow, velocity, and level inside the South Culvert. The sensor shall be connected to the electronic transmitter with a special 66 foot long, plastic jacketed, waterproof cable.

2. The electronic transmitter shall be housed in an integral ABS Plastic IP65, NEMA Type 4 watertight enclosure, suitable for wall or pipestand mounting. The transmitter shall contain a local electronic indicator. The transmitter shall connect to the velocity sensor and level sensor using a manufacturer-supplied cable, and output 3 4-20mA signals for flow, velocity, and level.

3. The velocity sensor shall be suitable for measuring bidirectional velocities within a range of +/- 29.53 ft/second and shall have an accuracy of +/- 0.5% of reading.

4. The level sensor shall be non-contact pulsed radar, with a beam angle of 4 degrees, with a range of 0 to 49.2 ft, and an accuracy of +/- 0.0006 ft of reading.

5. The sensor assembly shall be mounted to the culvert wall with hardware supplied by the manufacturer.

6. The radar velocity flow meters shall be Flow-Tronic Raven-Eye 2, with IFQ Monitor, without exception.

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 - PRESSURE INSTRUMENTS

PART 1 - GENERAL

1.1 SCOPE

A. This section covers the furnishing of pressure and level instruments and accessories required for the Instrumentation and 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. 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 City 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 City facility (quantity required shall be as indicated in the Instrumentation and Control System section). Software shall be capable of running under Microsoft's 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 PRESSURE AND LEVEL INSTRUMENTATION.

A. Pressure 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, or other corrosion-resistant materials. 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", Rosemount “Model 2051”, or Siemens “P320”.

B. Field Mounted Process Indicators

1. Field-mounted process indicators that are not integral with the transmitter shall be of the two wire type that accepts a 4-20 mA dc input and does not require a direct power source connection. Indicators shall have corrosion resistant, weatherproof housings and shall be suitable for operating over an ambient temperature range of 10 to +55°C. Indicators shall read in engineering units. A nameplate that describes the indicator service function and the scale units shall be provided on the indicator.

2. Indicators shall be of the digital display type with an accuracy of 0.1 percent. The display shall be 3 1/2 digit LCD type, with a digit height of not less than 0.5 inch and with a selectable decimal point. Indicators shall be Action Instruments "Series V560", Rosemount “Model 751”, or Precision-Digital "Model PD6600."

C. Annular Type Pressure Sensors

1. Pressure sensors shall be of the wafer type, designed to fit between standard class 150 and class 300 pipeline flanges. Flange material shall be the same as the surrounding pipeline. Sensor shall be flow through design with flexible elastomer sensing ring around the full circumference. The elastomer sensing ring shall be rigidly clamped between metal end cover flanges, and no part of the elastomeric sensing ring shall be

exposed to the external face of the sensor. There shall be no dead ends or crevices, and flow passage shall make the sensor self-cleaning.

2. The pressure-sensing ring shall measure pressure for 360° around the full inside circumference of the pipeline. Flexible sensing ring shall have a cavity behind the ring filled with fluid to transfer pressure to the gauge. Sensing ring material shall be compatible with the process. Fill fluid shall be suitable for use with the process temperatures.

3. Annular pressure sensors shall be Red-Valve “Series 48” or equal.

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 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

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. Watertight/dusttight pipe sleeves.
b. Materials as specified herein.

1.4 QUALITY ASSURANCE

A. <u>Tolerances</u>

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. 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.

D. Protective Coatings

1. Tape Wrap: ANSI/AWWA C209, except single ply tape thickness shall not be less than 30 mils ; Protecto Wrap “200” or Tapecoat “CT.”

2. 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 City 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.

B. Pipe Sleeves

1. Piping passing through concrete or masonry shall be installed through sleeves that have been installed before the concrete is placed or when masonry is laid. Pipe sleeves installed through floors with a special finish, such as ceramic or vinyl composition tile,

shall be flush with the finished floor surface and shall be provided with nickel or chromium plated floor plates. Unless otherwise indicated on the Drawings, in all other locations where pipes pass through floors, pipe sleeves shall project not less than 1 inch nor more than 2 inches above the floor surface, with the projections uniform within each area. In the case of insulated pipes, the insulation shall extend through pipe sleeves. Where the Drawings indicate future installation of pipe, sleeves fitted with suitable plastic caps or plugs shall be provided.

2. Holes drilled with a suitable rotary drill will be considered instead of sleeves for piping which passes through interior walls and through floors with a special finish.

3. 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.

3. Solvent Welded

a. Solvent welded connections shall only be used for PVC. 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.

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. Drilling and tapping of pipe walls for installation of pressure gauges or switches will not be permitted.

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.

3.4 PIPING ASSEMBLY

A. General

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 ACCEPTANCE

A. City 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, City 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. The size, service, and locations of ductile iron pipelines are covered in the Ductile Iron Pipe Schedule.

C. 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.

D. 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
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
C150	Standard for the Thickness Design of Ductile Iron Pipe
C151	Ductile-Iron Pipe, Centrifugally Cast, For Water
C153	Ductile-Iron Pipe, Compact Fittings, 3 in. through 24 in.

ANSI/AWWA Standards	Title
C203	Standards for Steel Pipe
C550	Protective Epoxy Interior Coatings for Valves and Hydrants
C600	Installation of Ductile Iron Water Mains and Their Appurtenances
M41	Ductile Iron Pipe and Fittings - Manual of Water Supply Practices

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. Experience Certification

1. Certification of pipe manufacturer's experience requirements. Manufacturer shall be a company specializing in manufacturing the products specified in this section with a minimum of three years documented experience.

C. ANSI/AWWA Certification

1. Certification by manufacturer (affidavit of compliance) for each item furnished in accordance with the ANSI/AWWA Standards.

D. Restrained joints details.

E. Gasket Certifications

1. Certification of gaskets by pipe manufacturer, certifying that gasket material is suitable for test pressures and services intended.

F. Certification of Joint Lubricant.

G. Joint Test Certification

1. Certification of proof-of-design tests for joints, including restrained joints.

H. Welded-on Outlet Certification

1. Certification of proof-of-design tests for welded-on outlets and experience documentation. Air test documentation for the welded-on outlets used for this project.

I. Fabrication Schedule.

1. Fabrication schedule covering each stage of the fabrication of the pipe.

J. Pipe Laying Schedule.

1. Pipe laying schedule complete with a sequence of laying and an explanation of all abbreviations used in the schedule. For long, straight pipe runs, the pipe laying schedule shall list the pipeline station and either the pipe centerline or invert elevation coordinated with the Drawings at least every 20 feet.

2. The annotated laying schedule showing all changes made during construction shall be submitted upon completion of the installation of the pipeline.

K. 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.

L. Deflection Measurement

1. The method that the Contractor proposes to use for measuring deflection of pipe joints.

M. 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 QUALITY ASSURANCE

A. Follow provisions of AWWA C600.

B. Rejected or defective materials shall be marked and removed from the work site.

C. The Contractor shall submit written evidence of the following:

1. Pipe Product Data. That the pipe furnished under this specification is in conformance with the material and mechanical requirements specified herein.

2. Test Data. Certified copies of independent laboratory test results or mill test results from the pipe supplier may be considered evidence of compliance provided such tests are performed in accordance with the appropriate ASTM or AWWA testing standarads by experienced, competent personnel. Pipe manufacturer’s test result shall be stamped by a licenced Professional Engineer (PE) employed by the pipe manufacturer. In case of doubt as to the accuracy or adequacy of mill tests, the City may require that the Contractor furnish test reports from an independent testing laboratory on samples of pipe materials.

D. All pipe, fittings, and accessories delivered to the site will be inspected for damage, cleanliness, and conformance ot the specifications. No damaged, broken, cracked, deformed, mishandled, imperfectly coated, defective pipe or fittings shall be used. At the sole discretion of the City and at no additional cost to the City, items that are not acceptable shall either be repaired or completely removed from the site.

1.5 N/A

1.6 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, pipe coating, and fittings. Hooks, wire brushes or other abrasive tools shall not be permitted to come into contact with polyethylene lining if such lining is specified.

C. Under no circumstances shall pipe or accessories be dropped or dumped.

D. Pipe and fittings shall not be moved by inserting anything into pipe ends.

E. 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.

F. If the lining of Owner-furnished pipe or fittings is damaged by Contractor during unloading or handling, the damaged pipe or fittings shall be replaced by and at the expense of Contractor. Where the damaged areas are small and readily accessible, Contractor may be permitted to repair the lining.

G. 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 Ductile Iron Pipe Schedule. The specified class includes service allowance and casting allowance.

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	mm	Threaded Ends (1)	Grooved Ends (2)

4-16	100-400	53	53

(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. All pipe shall be manufactured from at least 90% recycled ferrous scrap material.

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. 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.

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

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, gaskets with stainless steel gripping segments, 4 inch through 12 inch, working pressure rating 350 psi.	American "Fast Grip." U.S. Pipe "Field Lok 350 Gasket", or McWane Sure Stop 350 Gasket.

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	
Class 250 (Where identified on the Drawings)	Ductile iron, flat faced, with ANSI/ASME B16.1, Class 250 diameter and drilling.
All others	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. Provide ceramic-filled, baked-on, fluorocarbon resin coating for tee-bolts.
Nuts	ASTM A563, hexagonal, ANSI/ASME B18.2.2, heavy semifinished pattern. Provide ceramic-filled, baked-on, fluorocarbon resin coating for nuts.
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.
Mechanical Joints	ANSI/AWWA C111/A21.11, with ductile iron glands
Restrained Mechanical Joints (factory prepared spigot), 4 inch through 48 inch, working pressure rating at least 250 psi.	American "MJ coupled Joints," or Griffin U.S. Pipe "Mech-Lok." (thru 36” size only)

Restrained mechanical joints shall be suitable for a test or working pressure plus surge pressure of the rated working pressure plus 100 psi.

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 "411 Steel Coupling"; or Romac “Style 400” or "Style 501"; 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.
Grooved End Joints	AWWA C606.
Pipe Ends (rigid joints)	Grooved, with dimensions conforming to AWWA C606, Table 3.
Pipe Ends (flexible joints)	Shouldered, with dimensions conforming to AWWA C606, Table 4.
Couplings (non-shouldered pipe)	Tyco/Grinnell “Figure 772,” or Victaulic “Style 31.”
Couplings (shouldered pipe)	Victaulic “Style 41” or “Style 44.”
Flanged Coupling Adapters	Not Allowed.
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.
Tapping Saddles	Ductile iron, with stainless steel straps and synthetic rubber sealing gasket, 250 psi pressure rating.
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	

Zinc Coating	ISO 8179-1. The mass of the zinc applied shall be 200 g/m^2 of pipe surface area. A finishing layer topcoat shall be applied to the zinc. Mean dry film thickness of the finishing layer shall not be less than 3 mils with a local minimum not less than 2 mils. The manufacturer shall clearly mark the outside of each pipe indicating the pipe has been coated in accordance with these specifications.
Ceramic Epoxy Lining	TNEMEC Series 431 Perma-Shield® PL.
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, ANSI/AWWA C105/A21.5; LLDPE - 12 mil or HDCLPE - 4 mil.
Heat-shrinkable Coating and Primer (Shrink Sleeve)	ANIS/AWWA C216, cross-linked polyethylene sheeting precoated with adhesive; minimum 80 mils; type and recovery as recommended by Shrink Sleeve manufacturer; Canusa-CPS or Berry Plastics Water Wrap.
Wax Tape and Primer	ANSI/AWWA C217, cold-applied petroleum wax primer and cold-applied petroleum wax tape; Trenton Wax-Tape and Primer.
Medium Consistency Coal Tar	Carboline "Bitumastic 50" or Tnemec "46 465 H.B. Tnemecol."

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. Where acceptable to Engineer, grooved couplings may be used instead of flanges, provided that rigid grooving is used to preclude longitudinal pipe movement and angular deflection at joints. Fittings, valves, and equipment installed using grooved couplings shall be adequately supported and blocked or restrained to prevent rotation.

F. 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.

G. Flanged Coupling Adaptors

1. Flanged coupling adapters shall not be acceptable.

H. 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.

I. 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 eccentric or concentric as indicated on the Drawings. Reducers of eccentric pattern shall be installed with the straight side on top, so that no air traps are formed.

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 SHOP COATING AND LINING

A. The interior of all pipe and fittings, unless noted otherwise, shall be TNEMEC Series 431 Perma-Shield® PL.

B. The exterior surfaces of all pipe and fittings which will be exposed in both interior and exterior locations shall be shop primed. Field painting of exposed exterior surfaces is covered in the Protective Coatings section. 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 Work Covered by Contract Documents 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 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.

C. Carrier pipe installation in tunnels shall be as indicated on the Drawings and as specified in the Trenching and Backfilling section. All carrier piping within tunnels shall be restrained throughout, and adequately blocked before piping is pressurized to prevent movement. Carrier pipe in tunnels shall be pulled into place to keep the restrained joints extended.

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 FLANGED JOINTS

A. 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.

B. Insulated Flanged Joints

1. Insulated flanged joints shall be installed where indicated on the Drawings. In addition to one full-faced insulated gasket, each flange insulating assembly shall consist of one full-length sleeve, two insulating washers, and two backing washers for each flange bolt. The insulating gasket ID shall be 1/8 inch less than the ID of the flange in which it is installed. The insulated flanged joint accessories shall be installed in accordance with the instructions and recommendations of the insulating kit manufacturer.

3.9 DISMANTLING JOINTS

A. Dismantling joints shall be installed in accordance with the coupling manufacturer's recommendations.

3.10 MECHANICAL COUPLINGS

1. 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.

3.11 GROOVED-END JOINTS

A. Grooved-end joints with rigid type grooving shall be installed in accordance with the coupling manufacturer's recommendations. Completed joints shall be rigid and shall allow no angular

deflection or longitudinal movement. Except for closure pieces, field grooving of pipe will not be acceptable.

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 and as indicated on the Drawings. Where ductile iron pipe is also embedded or encased in concrete, including in locations beneath structures, the polyethylene encasement shall be installed around the pipe for 5 feet extending into each end of the concrete encasement.

2. All buried mechanical joint couplings with tie rods, mechanical couplings, restrained mechanical couplings and other pipe harness assemblies at structure walls shall be provided with two wraps of polyethylene encasement in addition to other corrosion protection coatings as specified herein.

3. 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.

4. 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.

5. The Contractor may use either Linear Low Density Polyethylene (LLDPE), or High Density Cross Laminated Polyethylene (HDCLPE) with the minimum properties indicated as follows:

Item	**LLDPE**	**HDCLPE**
Thickness, mil	12	4
Tensile Strength, psi	4,400	6,300
Elongation, percent	1,000	100
Dielectric Strength, v/mil	1,900	800
Tear Resistance, gf	4,400	250
Impact Resistance, g	1,100	800

6. Polyethylene encasement shall be provided in tubes. Sheeting is not allowed. The minimum tube size for each pipe diameter shall be in accordance with the following:

Nominal Pipe Diameter (inches)	Push-on Bell & Spigot Joints	Mechanical Joints
4	14	16
6	17	20
8	21	24
10	25	27
12	29	30
14	33	34
16	37	37

7. Color: The color of polyethylene encasement shall be green.

8. Adhesive Tape: Adhesive tape shall be a general purpose adhesive tape 1-inch wide and approximately 8 mils thick, such as Scotch Tape No. 50, Polyken No. 900, Tape coat CT or approved equal. Duct tape is not allowed.

9. Sheeting is permitted for use on point repaies under 12 feet in length. All point repairs 12 feet and longer shall use tubing.

B. Flanged Joints

1. The flange bolts and nuts on buried flanges, shall be protected by wrapping them with wax tape in accordance with ANSI/AWWA C217. A primer shall be applied prior to applying the wax tape. The application of the wax tape shall be as recommended by the wax tape manufacturer. There shall be no bare or unprotected ferrous metal surfaces.

2. Following application of the wax tape protection, the entire flanged joint shall be wrapped with two layers of polyethylene encasement as specified herein. The two wraps of polyethylene encasement shall be lapped a minimum of 12 inches with the polyethylene encasement on each side of the joint.

C. Other Assemblies

1. All ferrous metal clamps, tie rods, bolts, and other components of buried joint harnesses, tapping saddles, or pipe reaction anchorages in contact with earth or other fill material and not encased in concrete, shall be protected by wrapping them with wax tape in accordance with ANSI/AWWA C217. A primer shall be applied prior to applying the wax tape. The application of the wax tape shall be as recommended by the wax tape manufacturer. There shall be no bare or unprotected ferrous metal surfaces.

2. Following the application of the wax tape, the entire assembly shall be encapsulated with two wraps of polyethylene encasement lapped a minimum of 12 inches with the polyethylene encasement of the piping on each side of the assembly as specified herein.

D. Surfaces Exposed in Manholes and Vaults

1. Unless otherwise specified, all uncoated surfaces exposed in manholes and vaults shall be cleaned and coated with two coats of medium consistency coal tar. The first coat shall be

dry and hard before the second coat is applied. There shall be no unprotected, bare, or uncoated ferrous metal surfaces.

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.

3.14 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.

End of Section

Schedule 15061-S01

Ductile Iron Pipe Schedule

Size in.	Location and Service	ANSI/AWWA Class	Lining Material
4	Recirculation line inside TCPS	53	TNEMEC 431 Perma-Shield ® PL
6	Recirculation line inside TCPS	53	TNEMEC 431 Perma-Shield ® PL
6	Recirculation line in Yard	53	TNEMEC 431 Perma-Shield ® PL

End of Schedule

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 Submittal 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 Certifications.

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.

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. Interior drain piping.	Pipe Fittings	ASTM D1785, Cell Classification 12454, Schedule 80. ASTM D2467, Cell Classification 12454. 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. 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 for all systems.
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 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 Submittal 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-2

VB-2	Rating	500 psi nonshock cold WOG
		MSS SP-110
Ball valves indicated on the plumbing drawings for non-potable water service for metallic piping systems	Code	In-line, three piece, end entry, full port
	Type	ASTM B584-C84400 Bronze
	Body/Bonnet	
	Trim	Reinforced Teflon
2-1/2 inch and 3 inch	Seat	Brass or chrome plated
	Ball	Brass or Bronze
	Stem	Reinforced Teflon
	Thrust Washer	Teflon or Viton
	Stem Seal	Threaded End
	End Connection	-20 to 400°F Lever
	Temp. Limitations	Conbraco Industries "Apollo
	Valve Operator	82-100 Series"
	Manufacturers	

C. Valves Type VB-10

VB-10	Rating	150 psig nonshock cold WOG
Service as specified in Miscellaneous Plastic Pipe, Tubing, and Accessories section	Type	In-line, true union, full port (Schedule 80)
	Body/Bonnet	PVC or CPVC to match piping system
	Trim	
4 inch and smaller	Seat	Teflon
	Ball	PVC or CPVC to match piping system
Socket	Stem	PVC or CPVC to match piping system
	Thrust Washer	Teflon
	Stem Seal	Viton O-ring
	Body Seals	Viton O-rings
	End Connection	Socket
	Temp. Limitations	0 to 140°F
	Valve Operator	Lever
	Manufacturers	Hayward Plastic Products "True Union Ball Valve TBH Series"; Nibco "Chemtrol TU Series Tru-Bloc Ball Valve"; Spears Manufacturing Co "True Union 2000 Standard Series 3600 Ball Valve"

D. Valves Type VB-11

VB-11	Rating	150 psig nonshock cold WOG
Service as specified in Miscellaneous Plastic Pipe, Tubing, and Accessories section	Type	In-line, true union, full port (Schedule 80)
	Body/Bonnet	PVC or CPVC to match piping system
	Trim	
4 inch and smaller	Seat	Teflon
	Ball	PVC or CPVC to match piping system
	Stem	PVC or CPVC to match piping system
Flanged	Thrust Washer	Teflon

	Stem Seal	Viton O-ring
	Body Seals	Viton O-rings
	End Connection	Flanged, ASME B16.5, Class 150, raised face
	Temp. Limitations	0 to 140°F
	Valve Operator	Lever
	Manufacturers	Hayward Plastic Products "True Union Ball Valve TBH Series"; Nibco "Chemtrol TU Series Tru-Bloc Ball Valve"; Spears Manufacturing Co. "True Union 2000 Standard Series 3600 Ball Valve"

E. 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.

F. 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.

B. Valves indicated to be electric motor operated on the drawings shall have reversible electric motor operators designed for 120 volt ac, single phase operation. Actuators shall include integral thermal overload protection and a declutchable manual override. Actuators shall be equipped with motor operation limit switches and two additional single-pole, double-throw limit switches for auxiliary open and closed indication. An internal heater and thermostat shall be provided in each actuator housing to prevent condensation. Actuators in Class I, Division 1 and Division 2, Group D hazardous areas indicated on the drawings shall have NEMA Type 7 housings. Actuators in other areas shall have NEMA Type 4X housings.

2.3 ACCESSORIES

A. If the drawings indicate the need for extension stems, stem guides; position indicator; floor boxes; valve 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.

End of Section

SECTION 15102 - ECCENTRIC PLUG VALVES

PART 1 - GENERAL

1.1 SCOPE

A. This section covers furnishing all eccentric plug valves as required by the Work and as indicated in the Eccentric Plug Valve Schedule. Plug valves shall be furnished complete with actuators and accessories as specified herein, 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 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.

D. Governing Standard

1. Except as modified or supplemented herein, all eccentric plug valves and manual actuators shall conform to the applicable requirements of ANSI/AWWA C517.

E. Marking

1. Each valve shall be marked with the manufacturer's name, valve size, and pressure rating, and the country of origin of the body casting. All markings shall be cast on the exterior surface of the valve body. An identifying serial number shall be stamped on a corrosion-resistant plate attached to the valve body.

F. Temporary Number Plates

1. Each eccentric plug valve with an identifying number listed in the Eccentric Plug Valve Schedule, shall be tagged or marked in the factory with the identifying number.

G. Identification

1. Eccentric plug valves shall be identified 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.

B. Drawings and Data – Electrical and Wiring Diagrams

1. Drawings shall include separate wiring diagrams for each electrically operated or controlled valve and the electrical control equipment. Each drawing shall be identified with the valve number or name as specified in this section.

C. Certified Test Results

1. Certified copies of test reports for tests described in Section 5. of governing standard, with an affidavit of compliance as indicated in Section 6.3 of governing standard, shall be submitted to Engineer before the valves are shipped.

PART 2 - PRODUCTS

2.1 ACCEPTABLE PRODUCTS

A. Eccentric plug valves furnished under this section shall be manufactured by DeZurik, Pratt, Milliken, Val-Matic, Clow, or Victaulic, without exception.

2.2 VALVE SCHEDULE

Tag Number	VLV-021110	VLV-021111	VLV-021112
Size, inches	4	4	6
Rated Working Pressure, psi	25	25	25
Type of Service	Modulating	Open/Close	Open/Close
Application	Sanitary Sewer	Sanitary Sewer	Sanitary Sewer
Type of Installation	Inside, exposed on pipe	Inside, exposed on pipe	Inside, exposed on pipe
Ends	Flanged	Flanged	Flanged
Maximum Differential Pressure	25	25	25

Across Valve (psi)			
High Pressure Side of Plug	Seating	Seating	Seating
Type of Actuator	Intelligent Electric	Handwheel	Handwheel
Type of Housing	Weatherproof	N/A	N/A
Operating Time	60 sec	N/A	N/A
Power of Electric Actuator Motor, V/PH	480/3	N/A	N/A
Actuator Provides 120 VAC for Remote Controls	Yes	N/A	N/A
Number of Limit Switch Assemblies	N/A	N/A	N/A
Position Transmitter	Yes	N/A	N/A
Control Devices	Open-Stop-Close Push Button, Local-Off-Remote, Red and Green Indicator Lights	N/A	N/A
Remote Control Station	N/A	N/A	N/A
Extension Stems	No	N/A	N/A

2.3 MATERIALS

A. Materials used in the manufacture of eccentric plug valves shall be as indicated:

Body	Cast iron, ASTM A126, Class B; or ductile iron, ASTM A536, Grade 65-45-12.
Plug	Cast iron, ASTM A126, Class B; or ductile iron, ASTM A536, Grade 65-45-12.
Plug Facing	Chloroprene, Neoprene or Buna-N, 70 Type A durometer hardness in accordance with ASTM D2240.
Body Seat	Welded nickel overlay.
Upper and Lower Trunnion Bearings	Sleeve type; stainless steel or bronze.

Upper Thrust Bearing	TFE, Nylatron, or Delrin.
Stem Seal	V-type packing or U-cups, Buna-N or TFE.

B. The following are acceptable shop coatings.

Epoxy

For Liquid Service other than in potable water facilities	PPG Amercoat “Amercoat 385 Epoxy”, Carboline “Carboguard 890”, Sherwin-Williams "Macropoxy 646", or Tnemec “Series N69 Hi-Build Epoxoline II”.

2.4 VALVE CONSTRUCTION.

A. Valve Body

1. The valve port area of each valve shall be at least 80 percent of the cross section of the connecting piping for 20 inch and smaller valves and 70 percent for 24 inch and larger valves. Valves shall provide tight shutoff at the rated pressure from either direction. An adjustable closed position plug stop shall be provided.

2. Each valve body shall be plainly marked to indicate the seat end. The actual length of 10 inch and smaller valves shall be within plus or minus 1/16 inch of the theoretical length. The actual length of 12 inch and larger valves shall be within plus or minus 1/8 inch of the theoretical length.

3. Valve ends shall be compatible with connecting piping. All valves shall have flanged, grooved or mechanical joint ends as indicated in the Eccentric Plug Valve Schedule. Flange diameter and drilling shall conform to ANSI B16.1, Class 125. Flanges shall be flat faced and 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 of flange diameter. Grooved end dimensions shall conform to ANSI/AWWA C606, Table 5, for rigid joints. When grooved end valves are to be installed in flanged piping, two flange adapters compatible with the connecting piping shall be provided with each valve. Mechanical joint ends shall conform to ANSI/AWWA C111/A21.11.

B. Plug

1. The plug shall be of one-piece construction and shall have a cylindrical or spherical seating surface eccentrically offset from the center of the plug shaft. The interference between the plug face and the body seat, with the plug in the closed position, shall be externally adjustable in the field with the valve in the line under pressure. Plug surfaces shall be faced with a resilient material.

C. Seats

1. Seats shall be cast in the body and shall have raised, welded-in nickel overlay not less than 0.050 inch thick on all surfaces in contact with the plug face. The overlay shall be at least 90 percent nickel and have a Brinell hardness of 200 or greater.

D. Stem Seals

1. The valve shaft shall be sealed by U-cups or by at least four self-adjusting chevron type packing rings.

E. Working Pressure

1. Valves shall be rated for a minimum working pressure as specified below, except where otherwise indicated in the Eccentric Plug Valve Schedule.

Size in inches	Pressure Rating in psi
3 to 12	175

2.5 VALVE ACTUATORS

A. Requirements for valve actuators shall be as specified herein, indicated in the Eccentric Plug Valve Schedule, and as specified in the Valve and Gate Actuators section.

2.6 SHOP PAINTING

A. All interior and exterior ferrous metal surfaces, except bearing and finished 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	
For Liquid Service	Epoxy.
Exterior Surfaces of All Other Valves	Universal primer.
Polished or Machined Surfaces	Rust-preventive compound.

C. 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

2.7 ACCESSORIES

A. Requirements for extension stems and stem guides, position indicators, floor boxes, operating stands, and valve boxes shall be as indicated in the Eccentric Plug Valve Schedule and as specified in the Valve and Gate Actuators section.

2.8 TESTING

A. Except as modified herein, eccentric plug valves shall be tested in accordance with Section 5 of the governing standard. Each valve shall be performance tested in accordance with Section 5.2 of the governing standard. The leakage test shall be applied to the seating face of the plug (tending to unseat the plug) at the rated pressure of the valve.

B. Each valve shall be leaktight in both directions when closed by the actuator with the maximum differential pressure applied to the plug as specified herein and in the Eccentric Plug Valve Schedule.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Valves shall be installed in accordance with Valve Installation section.

B. Installation Check

1. An installation check by an authorize representative of the manufacturer is not required.

2. 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.

3. 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.

4. All costs for these services shall be included in the contract price.

End of Section

SECTION 15108 - AIR VALVES

PART 1 - GENERAL

1.1 SCOPE

A. This section covers furnishing air-release 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. Air release valves for wastewater applications with operating pressures of 300 psi or less shall be Apco/Valve and Primer “No. 400 or 450”, Multiplex “Crispin S Series”, ARI “No. S-020”, or Val-Matic “VM-48A or 49A”.

2.2 MATERIALS

A. Except as modified or supplemented herein, materials of construction shall comply with the governing standard.

Valve Trim	Bronze or austenitic stainless steel or polymer materials. Valve trim for valves in wastewater service shall be austenitic stainless steel.
Float	Austenitic stainless steel, polycarbonate, or foamed polypropylene.
Shop Coatings	
Epoxy	PPG Amercoat “Amercoat 385 Epoxy”, Carboline “Carboguard 890”, Sherwin-Williams "Macropoxy 646" or Tnemec “Series N69 Hi-Build Epoxoline II”.
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 Wastewater Applications	Epoxy
Exterior Surfaces of All Other Valves	Universal primer.
Polished or Machined Surfaces	Rust-preventive compound.

2.4 SHUTOFF VALVES

A. A shutoff valve shall be provided in the piping leading to each air valve. Shutoff valves 2 inches and smaller shall be ball valves as specified in the Miscellaneous Ball Valves section. Shutoff valves 3 inches and larger for clean water service shall be butterfly valves as specified

in the AWWA Butterfly Valve section. Shutoff valves 3 inches and larger for wastewater service shall be eccentric plug valves as specified in the Eccentric Plug Valve section.

B. Each 4 inch and larger combination air valve shall be provided with a shutoff valve between the air and vacuum valve and the air release valve.

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 15111 - GATE INSTALLATION

PART 1 - GENERAL

1.1 SCOPE.

A. This section covers the installation of bending weir gates and accessories, as well as the storm sewer isolation gate and accessories.

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 gates and actuators identified as being provided by the gate manufacturer will be furnished complete for installation by Contractor.

C. Coordination.

1. When installation check services are provided by the gate manufacturer, Contractor shall coordinate the services with the gate manufacturer. Contractor shall give the gate manufacturer written notice at least 30 days prior to the need for manufacturer's installation check services.

2. Submittals for equipment furnished by the others 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.

PART 2 - PRODUCTS

2.1 MATERIALS.

A. Materials shall be as follows:

Grout	As specified in the Grouting section

PART 3 - EXECUTION

3.1 INSPECTION.

A. All gates, actuators, 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 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 INSTALLATION.

A. General.

1. Gate and appurtenances shall be installed with sufficient clearance for proper operation of any external mechanisms, and with sufficient clearance to dismantle the gate for maintenance. Installation shall be in accordance with the manufacturer's recommendations and the requirements specified herein.

2. All bolts shall be tightened and all items requiring lubrication, including pivot pins, shall be lubricated. Anti-seize thread lubricant shall be liberally applied to the threaded portion of stainless steel anchor bolts during the installation and tightening of nuts. Excess lubricant shall be thoroughly removed following final tightening.

3. The gate shall be adjusted so that it does not bind or leak in excess of specified requirements. After installation, each gate shall be operated through at least five complete open-close cycles, re-adjusted and re-operated as necessary, and left in a condition acceptable to Engineer.

B. Installation Checks.

1. As specified in the bending weir gate section, the gate manufacturer shall provide installation checks following installation by the Contractor. The manufacturer's representatives will revisit the site as often as necessary to ensure installation satisfactory to Owner and Engineer.

3.3 FIELD TESTING.

A. After the installation is complete, the gate system shall be tested and operated under the direction of the gate manufacturer’s field installation supervisor and shall include pre-test check-out, functional testing, functional acceptance testing, and gate leakage testing.

B. Pre-Test Checkout.

1. Pre-test checkout shall consist of adjusting, testing, and operating the gate and controls.

   a. Visually inspect the gate installation. Assure all components are assembled, fasteners tightened, path of travel is clear, fluid levels are full, and sealing surfaces are clean.
   b. Lubricate or wet the seals as directed by the gate manufacturer field installation supervisor.
   c. Confirm the inclinometer functions properly during opening and closing, as applicable.
   d. Visually re-inspect the system to assure everything is as it should be.

C. Startup.

1. The gate operating systems shall be tested under the supervision of the manufacturer's field installation supervisor and the System Supplier. Startup shall include functional testing and functional acceptance testing as outlined in the Startup Requirements section. The gate operating system shall be operated through all modes of operation, testing all monitoring and control functions under dry weather conditions.

D. Leak Testing.

1. After installation, the gates shall be leak tested for both the seating and unseating conditions. Allowable leakage criteria are as specified in the Bending Weir Gates section. Leakage rates shall be measured and recorded at 5 foot intervals for all depths from 1 foot to full design head.

2. Leakage exceeding the specified limits which is discovered within the correction period stipulated in the General Conditions shall be repaired by and at the expense of Contractor.

3. Contractor shall provide temporary bulkheads and water for leak testing of the gates. Groundwater, combined sewage or river water can be used for testing. A leak testing plan shall be submitted for review at least 30 days before testing.

End of Section

SECTION 15114 - OPEN-CHANNEL METAL SLIDE GATES

PART 1 - GENERAL

1.1 SCOPE

A. This section covers furnishing slide gates and actuators as specified herein and as indicated in the Open Channel Metal Slide Gate Schedule. Slide gates shall be furnished complete with frames, slides, seals, actuators, operating stems, and appurtenances as specified herein, as indicated in the schedule and as specified in the Valve and Gate Actuator section.

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. Gates and 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 products of a manufacturer engaged in the production of slide gates.

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 slide gates shall conform to the applicable requirements of ANSI/AWWA C561 and ANSI/AWWA C562.

E. Identification

1. Slide gates specified herein shall be tagged as specified in the Equipment and Valve Identification section.

1.3 SUBMITTALS

A. Drawings and Data – General

1. Complete drawings, construction details, anchorages, and specifications covering the slide gates and appurtenances shall be submitted in accordance with the Submittals Procedures section. Each drawing shall be identified with the slide gate designation.

B. Electrical and Wiring Drawings

1. Drawings shall include separate wiring diagrams for each electrically actuated gate and related electrical control equipment.

PART 2 - PRODUCTS

2.1 SERVICE CONDITIONS

A. Isolation of sanitary sewer and storm drain discharge into the North Rock Box.

2.2 GATE SCHEDULE

Tag Number	SG-106
Location	North Rock Box
Nominal Size, W x H, inches	18 x 18
Maximum Head of Water (Seating) Above Invert Gate, ft	0
Maximum Head of Water (Unseating) Above Invert Gate, ft	1.25
Invert Elevation	748.02
Operating Floor Elevation	764.77
Top of Yoke Elevation	768.27
Type of Mounting	Face-mounted self-contained
Type of Closure	Flush Bottom
Dual Stems Required	No
Special Notations	None
Suitable for use with an Electric Portable Actuator	Yes
Suitable for use with a Hydraulic Portable Actuator	No
Type of Manual Actuator	Handwheel-operated, geared, benchstand
Limit Switches	N/A
Plastic Stem Cover	Yes
Steel Stem Cover	No

2.3 PERFORMANCE AND DESIGN REQUIREMENTS

A. Slide gates shall be designed for the conditions and requirements indicated in the Slide Gate Schedule.

B. Design

1. 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-fourth of the ultimate strength of each material.

2. Gates shall be designed for the seating and unseating heads indicated in the Slide Gate Schedule.

3. Gates shall be designed to fit into the structures indicated on the Drawings.

2.4 ACCEPTABLE MANUFACTURERS

A. For slide gates acceptable manufacturers are Coldwell-Wilcox, Golden Harvest, Hydro Gate, Waterman, Fontaine, , Rodney Hunt, and Whipps.

2.5 MATERIALS

Frames, Guides, Slides, Reinforcing Members, and Yoke Beams	Aluminum, ASTM B209, B211, B221, or B308, Alloy 6061-T6.
Flush Bottom Closure Seal	Compressible neoprene.
Hollow Bulb J-Seals	Compressible neoprene.
Seal Retainer Bar	Aluminum, ASTM B211 or B221, Alloy 6061-T6.
Slide Seats and Bearing Bars	UHMW polyethylene.
Operating Stems	Stainless steel, AISI Type 304 or 316.
Assembly Fasteners	Stainless steel, AISI Type 302, 303, or 304.
Epoxy Enamel	PPG-Amercoat "Amercoat 385 Epoxy", Carboline "Carboguard 890", Sherwin-Williams "Macropoxy 646" or Tnemec "Series N69 Hi-Build Epoxoline II".
Anchor Bolts	As indicated in the Anchorage in Concrete and Masonry Section.

2.6 CONSTRUCTION

A. Frames

1. Each frame shall be an integral unit of extruded or welded structural shapes at least 1/4 inch thick. Frames shall be designed for embedment in concrete or installation on the face of concrete walls as indicated in the Slide Gate Schedule. Embedded frames shall be recessed so that the waterway is not obstructed.

2. Guides shall be provided on each side of each frame. Guides shall be sufficiently strong to require no further reinforcing where they extend above the operating floor, and shall support the entire height of the slide in all positions.

3. Full-length plastic slide seats or bearing bars shall be provided on the downstream side of the slide on gates subject to seating pressure from one direction. Gates subject to seating pressure from either direction shall be provided with plastic seats or bearing bars on both faces of the slide. Seats and bars shall be mechanically retained in the frame.

4. Self-contained gates shall be equipped with a yoke, shop welded to the top of vertical frame members to support the actuator. Yokes shall be fabricated from a pair of rolled or extruded channels or angles and shall be designed to deflect not more than 1/360 of the span when the gate is operated at the maximum actuator thrust with the safety factor as indicated in the governing standard. Each yoke shall be designed to permit vertical removal of the slide. Actuators shall be mounted so that no eccentric loads are transmitted to the yoke.

B. Slides

1. Slides shall be at least 1/4 inch thick and shall be provided with welded stiffeners to limit deflection to 1/360 under the maximum seating or unseating head indicated in the Slide Gate Schedule. Slides shall be adequately reinforced to withstand, without permanent distortion, the maximum thrust which can be transmitted by the operating stem. Each slide shall have a reinforced pocket or an internally threaded nut welded to the slide for connection of the stem. The pocket or nut shall be designed to withstand the maximum thrust which can be transmitted by the operating stem.

C. Closures

1. The bottom of each slide gate frame shall be recessed so that the waterway is not obstructed. A compressible seal shall be securely attached to the bottom of the slide or to the frame invert. The seal shall be of sufficient length to seal the bottom corners of each slide.

2. Where indicated in the Slide Gate Schedule, gates shall be provided with resilient hollow bulb J-seals attached to the frame members.

3. For weir service, slides may be lowered below the bottom of the opening. A frame member shall be provided at the bottom of the opening to seal the space between the slide and the adjacent concrete. The side guides shall be extended below the bottom of the

wall opening. A resilient hollow bulb J-seal shall be attached to the frame along the invert of the opening and up both sides to seal the slide in any positions.

4. Each J-seal shall be provided with a full-length retainer bar which shall compress the seal and prevent leakage between the seal and the frame member. The method of attachment of J-seals to frame members shall permit replacement of the seals without disassembling or removing the gate.

5. An acceptable alternative to J-seal is a UHMW polyethylene seal/seat. A UHMW polyurethane seat/seal extruded shape shall fit into a dovetail grove in the guide section, and shall seal on both upstream and downstream sides of the slide. The seat/seal system shall act as both a bearing surface and as a seal, and the seal system shall be self-adjusting. The seat/seals shall be easily replaced without removing the gate from the wall. For flush bottom application, the invert shall have a replaceable resilient neoprene seal mounted on the frame invert.

D. Operating Stems

1. Operating stems shall conform to the requirements of Section 4.3.6 of the governing standard. Contact surfaces of threads shall be rolled or machined to a 63 microinch finish, or smoother. Each stem shall be securely attached to the slide.

2. Dual stems shall be provided where listed in the Slide Gate Schedule or where required for proper operation of the gate.

E. Stainless Steel

1. All stainless steel shall be pickled in accordance with ASTM A380 at the mill before being shipped. Pickling shall produce a modest etch and shall remove all embedded iron and heat tint. After fabrication, pickled surfaces shall be subjected to a 24 hour water test or a ferroxyl test to detect the presence of residual embedded iron. All pickled surfaces damaged during fabrication including welded areas shall be repickled or passivated in accordance with ASTM A380 as needed to remove all traces of iron contamination. All stainless steel surfaces shall be adequately protected during fabrication, shipping, handling, and installation to prevent contamination from iron or carbon steel objects or surfaces.

2.7 ACTUATORS

A. Actuators and their accessories shall be the type as indicated in the Slide Gate Schedule and as specified in the Valve and Gate Actuator section.

B. Stem covers for manual actuators shall be UV resistant clear plastic, polycarbonate, or steel pipe as indicated in the Slide Gate Schedule and as specified in the Valve and Gate Actuator section.

C. The gate manufacturer shall furnish portable electric actuators as specified in the Valve and Gate Actuator section.

2.8 SHOP PAINTING

A. All surfaces of aluminum which will be in contact with concrete, mortar, grout, or dissimilar metals shall be given a coat of epoxy enamel or coal tar epoxy. The epoxy coating shall be NSF certified for gates installed in a potable water facility.

2.9 SHOP TESTING

A. Gates shall be completely assembled in the shop to ensure that all parts fit together properly.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Slide gates and appurtenances shall be installed in accordance with the Gate Installation section.

B. Installation Check

1. An installation check by an authorize representative of the manufacturer is not required.

2. 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 jobsite as often as necessary until all trouble is corrected and the equipment installation and operation are satisfactory in the opinion of Engineer.

3. 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.

4. All costs for these services shall be included in the contract price.

End of Section

SECTION 15121 - BENDING WEIR GATES

PART 1 – GENERAL

1.1 SCOPE.

A. This section covers furnishing and installation of a bending weir gate as specified herein and as shown on the drawings. The gate shall be furnished complete with embedments, side seal plates, anchorage system, counterweights mechanism and weights and appurtenances as specified herein and as shown on the Drawings, and as required for a complete and properly operating system.

1.2 GENERAL.

A. Gate 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 bending weir gates.

B. 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.

C. Governing Standard.

1. Except as modified or supplemented herein, the gate shall conform to the applicable requirements of U.S. Army Corps of Engineers ETL 1110-2-584 Design of Hydraulic Steel Structures. In case of a conflict between the governing standards and this specification, the more stringent requirements shall be used.

D. Experience.

1. The gate systems shall be the product of a manufacturer regularly engaged in the design and fabrication of bending weir gates. The manufacturer shall have furnished equipment of the type and size specified which has been in successful operation for not less than the past ten (10) years. In addition the manufacturer shall have supplied a minimum of two (2) bending weir gates of size comparable to those required for this project within the last ten (10) years. Proof of experience shall be submitted with the bid listing representative bending weir gates designed and manufactured for the last ten (10) years. Listing shall include size of bending weir gate, operating head, material of gate, year of manufacture, and contact name and phone number of gate Owner.

2. Manufacturer personnel proposed to work on the design and fabrication of the gates shall include a Project Manager with a minimum of five (5) years of experience with gate projects, a Design Engineer with a minimum of ten (10) years

of experience designing bending weir gates of comparable size, and a Quality Control Leader with a minimum of ten (10) years of applicable experience. Current licenses, certifications held, and resumes of the proposed personnel shall be submitted with the bid. Proposed personnel shall not be changed without the written approval of the Engineer.

E. Minimum Metal Thickness.

1. Where so indicated in the governing standard, the design safety factors pertaining to tensile, compressive, and shear strength of materials used shall be observed. In addition, unless otherwise acceptable to Engineer, all submerged components of each gate shall have a metal thickness of at least 1/4 inch.

F. Special Tools.

1. A set of special tools required for testing and maintenance of the gates shall be provided as needed. Special tools are those which have been specially manufactured or adapted for use on the equipment and which are not customarily carried by maintenance personnel. All special tools shall be coated to resist corrosion and identified as to their intended use. A list of tools that are provided shall be furnished.

G. Spare Parts.

1. Spare parts shall be packaged for long-term storage and clearly marked as to their intended use. The following spare parts shall be provided:

a. One set of seals and rings for each side
b. One set of counterweight mechanism including: SSTL cable and anchor system (not including weight and anchoring system).

H. Identification.

1. The gate shall be permanently tagged in accordance with the Equipment Identification section. Identifying numbers are shown on the Drawings.

1.3 SUBMITTALS.

A. Complete shop drawings and design calculations for embedments and a summary of loads imposed on the structure shall be submitted to Owner in Adobe Acrobat's Portable Document Format (PDF) as part of submittal. Submittals shall include drawings, data and as listed below:

1. Calculations (signed and sealed by a professional engineer)

2. Specifications covering the bending weir gates, counterweights, mechanical components, and appurtenances.

B. Drawings and Data.

1. The data and specifications for each unit shall include, but shall not be limited to, the following:

   a. Overall Bending Weir Layout
   b. Name of manufacturer
   c. Tag number
   d. Weight
   e. Special Tools Required
   f. Material of Construction
   g. Design computations for all items designed by manufacturer
   h. Detailed shop drawings for fabrication
   i. Shop assembly drawings detailing connections to adjoining fabricated components
   j. Embedded parts drawings
   k. Catalog data and descriptive literature for standard products used in the work
   l. Data on shop painting
   m. Shop testing procedures
   n. Shop testing reports
   o. Instructions for maintenance and care during storage
   p. Field assembly drawings
   q. Field installation drawings (plan and section cuts)
   r. Field cleaning procedures
   s. Field testing procedures
   t. Results of field leakage tests

2. The manufacturer shall have a Quality Program Manual (QPM) that describes how it will assure the equipment will be fabricated in accordance with the drawings and specifications. The manufacturer's QPM shall conform to the applicable requirements of ANSI/ASQC Q90, "Quality Systems – Model for Quality Assurance in Production, Installation, and Service." Manufacturer shall submit copies of its QPM upon request by Engineer.

C. Operations and Maintenance Data and Manuals.

1. Adequate operation and maintenance information shall be supplied for all items requiring maintenance or other attention. The gate manufacturer shall prepare a project specific Operations and Maintenance (O&M) manual as outlined in the Submittal and O&M Procedures Sections. The O&M Manual shall include all information which may be needed or useful for operation, maintenance, repair, dismantling, assembly, and for identification of parts.

2. Additional to the requirements listed in the Submittal Procedure Section, the O&M Manual shall include the following:

   a. Inspection and maintenance instructions
   b. Recommended inspection and maintenance intervals
   c. Recommended lubricants and fluids
   d. Gate hinge bearing overhaul and replacement instructions

e. Seal replacement instructions
f. Cross-section drawings of the gates showing all assembly components with parts list
g. Dimensional drawings
h. Layout and installation drawings
i. Sub assembly drawings for actuator trunnions and gate hinges
j. Records of shop assembly measurements
k. Schematic layout drawings showing the hydraulic system
l. Manufacturer's bulletins, catalog cuts, and descriptive data

1.4 DELIVERY, STORAGE, AND HANDLING.

A. Gate manufacturer 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 sub suppliers making direct shipments to the Site.

B. All equipment shall be suitably packaged to facilitate handling and to protect against damage during transit and storage. All electrical and mechanical equipment shall be boxed, crated, or otherwise completely enclosed and protected during shipment, handling, and storage. All electrical and mechanical equipment shall be protected from exposure to the elements and shall be kept dry at all times.

C. 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.

D. 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.

1.5 WARRANTY.

A. The manufacturer shall furnish three copies of the warranty that applies to the bending weir (including anchorage system, sealing mechanism, counterweight system, control panel and electrical components and all other mechanical components) furnished. The warranty of shall be a minimum of five (5) years from date of the Substantial Completion of the Project which the gates are installed. A limited warranty is not allowed.

PART 2 - PRODUCTS

2.1 SERVICE CONDITIONS.

A. Gate will be used to control and modulate flow (combined sewer) to a preset upstream water level in a box culvert and to provide flood protection during high wet weather events.

2.2 PERFORMANCE AND DESIGN REQUIREMENTS.

A. Gate shall be designed for the conditions and requirements indicated herein.

Gate Number	BW-1
Location	Access Structure
Nominal Gate Size, Width x Height	14’-0” (min) [3]
Design Head, Seating/Unseating	9 ft / 9 ft
Operating Head, Seating/Unseating	9 ft / 9 ft
Top of Weir Elevation	738.00 ft

Notes:

1. Design head is measured from the bottom of the gate.
2. Flows are dependent on a 10 year flood elevation.
3. Final length and height dependent on Gate Manufacturer Design.

B. Gate shall be designed for the design seating and unseating heads indicated in the Gate Schedule. Both the design head and the operating head shall be measured from the surface of the liquid to the bottom of the gate.

C. Gate shall be designed to modulate to maintain the upstream water level constant to +/- 1 inches. If the upstream overflow exceeds the design flow, the bending weir shall accommodate the additional flow by remaining in the fully open position. If the downstream water level rises and submerges the bending weir, the bending weir shall remain in the fully closed position and act as a submerged broad-crested weir.

D. The gate shall be structurally designed to withstand the worst combination of static and dynamic loadings at any position with the upstream water depth at the full design seating head and the downstream water depth is zero and with the downstream water depth at the full design unseating head and the upstream water depth is zero.

E. Allowable Leakage.

1. The allowable leakage during field testing for both seating and unseating head conditions shall not exceed 0.10 gpm/ft of sealing perimeter with water depths from zero to full depth head.

2. The gate manufacturer shall designate installation tolerances to be met by the Contractor necessary to achieve the specified leakage rate.

2.3 MATERIALS.

A. Materials of construction shall be as follows:

Gate Leaf, Side Seal Plates, Seal Retainer Plates, Hinges, Embedments, and Other Components Not Otherwise Specified	Type 316 or 304 SSTL; or other equally corrosion resistant stainless steel approved by Engineer.
Bearings, Bushings, and Thrust Washers	Self-lubricating bronze; Lubrite, Lubron, or Equal. UHMWPE Polymer.
Seals	Fluorocarbon (Teflon) clad rubber seals, compounded of neoprene rubber; Seals Unlimited or equal.
Counter weights	Type 304 or 316 SSTL
Counter weights support mechanism	Type 304 or 316 SSTL
Bolts & Nuts	ASTM F593 and F594, Alloy Group 2; or other equally corrosion resistant stainless steel approved by Engineer. Type 304 or 316 SSTL
Threaded Rod	ASTM 593, Alloy Group 2, 316 SSTL; or other equally corrosion resistant stainless steel approved by Engineer.
Concrete Anchors	Type 304 or 316 SSTL
Epoxy	PPG Amercoat "Amercoat 385 Epoxy", Carboline "Carboguard 890", Sherwin-Williams “Macropoxy 646NSF” or Tnemec "Series N69 Hi-Build Epoxoline II".
Aliphatic Polyurethane	PPG Amercoat "Amercoat 450HS", Carboline "Carbothane 134HG", Sherwin-Williams “Acrolon 218HS” or Tnemec "Series 1074 Endura-Shield II".

2.4 CONSTRUCTION.

A. Gate shall be designed and detailed for a 100-year service life with minimal maintenance. Gates shall consist of a self-contained bending weir unit and shall be as manufactured by Grande, GNA Ltd. of Champlain, NY (Hydrobend) or pre-approved equal.

B. Gate Leaf.

1. Bending Weir Gate leaf shall be a one or two-piece welded assembly of skin plates, vertical members and horizontal diaphragm plates. If a two-piece assembly is used to facilitate shipping, the two pieces shall be connected with a bolted splice. Nappe breakers and a discharge lip on the top edge of the skin plate shall be included to minimize flow induced vibrations. Permanently installed lifting lugs shall be provided for installation and future removal of the gate.

C. Bearings.

1. Bearings shall use self-lubricating bushings. Bearings shall be anchored to the concrete structure in a manner that will allow adjustment in all three planes during erection of the leaf.

D. Seals.

1. Seals shall seal in all leaf positions for both seating and unseating heads. Seals and seal retainer plates shall be designed for adjustment and replacement of the seals without removal of the gate leaf.

E. Side Seal Plates.

1. Side seal plates shall include all embedments required for the accurate positioning of the plates and air vent piping.

F. Gate Stops.

1. Adjustable downstream gate stops shall be provided to support the weight of the gate in the fully lowered position.

2. Adjustable upstream gate stops shall be provided to prevent the gate from rotating upstream beyond its fully raised design position in the event of a total failure of the hydraulic actuator system during a downstream flood condition. Upstream gate stops shall be designed to restrain the gate with downstream water depth at the full design unseating head and upstream water depth is zero.

2.5 CONTROLS

A. System Controls.

1. The Bending Weir shall not require any controls for operation. An inclinometer shall be provided to monitor the overflow rate and duration over the bending weir when it is in operation.

2. The inclinometer shall be supplied by the bending weir manufacturer. The inclinometer is a REIKER product, Model H6EX. The unit will work on 24 VDC power supply. It shall measure angles from 0 to 90 degrees and outputs a corresponding analog signal varying from 4 mA (0 degrees) to 20 mA (90 degrees). The inclinometer will be shipped with a 60 ft long 2-wire cable and shall be rated for a Class I, Div 1 area and rated IP68. The inclinometer shall be wired through an Intrinsically Safe Relay.

3. The bending weir manufacturer shall supply the relationship between the operating angle, the 4-20 mA output and the corresponding flow.

4. Overall Control Scheme is as indicated in the Software Control Block Descriptions Section.

2.6 SHOP PAINTING.

A. All iron and steel surfaces, except machined surfaces and stainless steel, shall be shop cleaned by blasting in accordance with the coating manufacturer's recommendations and finish painted with an epoxy or epoxy/polyurethane coating system. Non-submerged components shall be painted with two coats of epoxy paint having a total dry film thickness of at least 10 mils and one topcoat of polyurethane having a dry film thickness of at least 2 mils. All components subject to submergence shall be painted with three coats of epoxy paint having a total combined dry film thickness of at least 15 mils.

B. Finish color shall be medium gray. Field painting of gates, actuators, and appurtenances, other than touchup painting, will not be required. A sufficient quantity of additional coating materials shall be furnished by the gate manufacturer to permit field touchup of damaged coatings.

C. Unless otherwise specified, all items fabricated from stainless steel shall be thoroughly cleaned and degreased after fabrication. Pickling or a light blast cleaning shall produce a modest etch and remove all embedded iron and heat tint. Surfaces shall be subjected to a 24 hour water test or a ferroxyl test to detect the presence of residual embedded iron and shall be retreated as needed to remove all traces of iron contamination. Surfaces shall be adequately protected during shipping and handling to prevent contact with iron or steel objects or surfaces.

PART 3 - EXECUTION

3.1 MANUFACTURE.

A. The fabrication of all parts shall be in conformance with the latest revisions of AISC 360 and AWS D1.6. All material shall be new with material test reports available for review by the Engineer.

B. Fabrication and Workmanship.

1. All welding, welding procedures, welder qualifications, and weld inspector qualifications shall be in accordance with AWS standards. Welder qualification records and weld inspector qualification records shall be available for review by the Engineer. The manufacturer shall submit a weld inspection plan before fabrication begins.

2. All welds shall receive visual inspection. All welds associated with Fracture Critical Members (FCM) as defined in the U.S. Army Corps of Engineers document ETL 1110-2-584 shall receive 100 percent nondestructive examination using ultrasonic or radiographic methods. All fillet welds between the skin plate and beams, all fillet welds in the main beams, and fillet welds between main components shall be given a complete non-destructive examination using magnetic particle or liquid dye penetrant tests. All multiple pass welds shall be magnetic particle tested after each pass. For each type of joint or weld remaining, 50 percent of the weld length shall be tested by NDE other than visual of which 25 percent shall be ultrasonic or radiographic.

3. Defective welds shall be repaired in accordance with AWS D1.6. Welds that have been repaired shall be retested by the same method used in the original test. Costs of repairs and retesting shall be borne by the manufacturer.

C. Shop Assembly.

1. The gate leaf including the attachment of all assemblies shall be completely assembled in the shop. The gate pivot bores shall be sighted to assure correct alignment of the centers. Each hinge shall be assembled to the leaf at its respective location. The hinges shall be anchored to a foundation and the gate rotated through its full range of swing.

2. During shop assembly the gate shall be checked for dimensions, tolerances, accuracy of alignment, and squareness. The manufacturer shall make record of the measurements of all critical dimensions which may affect the field erection and alignment or the operation and maintenance of the gate. The record shall be included in the Operations and Maintenance Manual. Before disassembly, each part shall be match marked and identified in accordance with the erection drawings. Such markings shall be done so as to retain legibility until field erection is complete.

D. Seals.

1. Seal assemblies shall be attached to the gate leaf during shop assembly. The rubber seals of the assemblies shall be accurately fitted and drilled to match the seal retainers.

E. Hydraulic Actuator. Not used.

F. Factory Inspection.

1. The Owner and Engineer will witness the factory testing during one visit. Manufacturer shall include in its bid all expenses for transportation, lodging, and meals required for one Owner inspectors and one Engineer inspector. If re-testing is required during another visit, manufacturer shall pay for the additional expenses for Owner and Engineer inspectors.

3.2 INSTALLATION.

A. Gates and appurtenances will be installed in accordance with the Gate Installation section.

B. Installation Supervision and Field Testing.

1. The gate manufacturer shall furnish a qualified field installation supervisor. Manufacturer’s installation supervisor shall observe, instruct, and guide the Contractor's erection or installation procedures. The gate manufacturer will be provided with written notification ten (14) days prior to the need for such services.

2. 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, and 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.

3. Field leakage tests will be performed by the Contractor. A representative of the gate manufacturer shall be present during these tests. Results of the field leakage tests shall be submitted to the Engineer.

4. 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.

5. All costs for these services shall be included in the Contract Price.

3.3 OPERATOR TRAINING.

A. During the startup of the project, the gate manufacturer shall provide a minimum of two (2) days of hands-on training for Owner’s personnel. The date(s) of training shall be

agreeable to the Owner and might not be on consecutive days. All costs for these services shall be included in the Contract Price.

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. PVC Schedule 80

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. 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. Materials of construction for fabricated steel supports are covered in the Structural 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. Stainless steel supports shall be AISI Type 304 or 316 stainless steel, except for stainless steel supports fabricated by welding which shall be AISI Type 304L or 316L. Stainless steel supports shall be provided as indicated in the Drawings.

H. Hot-dip galvanized supports shall be in accordance with ASTM A153 and A385. Galvanized supports shall be provided as indicated in the Drawings.

I. Pipe support types and application shall comply with Table 1.

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. When expansion joints are required, pipe guides shall be provided adjacent to bellows type expansion joints. Guides will not be required where mechanical couplings are permitted as expansion joints. Guides shall be located on both sides of expansion joints, except where anchors are adjacent to the joint. Unless otherwise indicated on the Drawings, one guide shall be within four pipe diameters from the joint and a second guide within 14 pipe diameters from the first guide. Pipe supports shall allow adequate movement; pipe guides shall not be used for anchoring pipe against longitudinal forces. Pipe guides shall be provided at locations as recommended by the manufacturer.

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 58 Type (Note 1)	Specification
Concrete Inserts, Steel		
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.
Beam Clamps, Malleable Iron or Steel, 12 inch and smaller pipe	21	B-Line “3050” and “3055,” Anvil “133” and “134,” or Piping Technology & Products Fig. 130 and Fig. 130 (SP).
	28, 29	Anvil “292” or Piping Technology & Products Fig. 140.

TABLE 1 - TYPES OF SUPPORTS

Description and Service	MSS SP 58 Type (Note 1)	Specification
	30	B-Line "3054," Anvil "228," or Piping Technology & Products Fig. 140.
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.

Table 1 Notes:

1. MSS SP-58 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.

3.3 SUPPORT SPACINGS

A. Pipe supports and expansion joints shall be spaced in accordance with Table 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 table 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 table.

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
Cast iron or Ductile iron	15	80	80	Note 6
PVC, Schedule 80, for services at a maximum temperature of 100° F and a maximum specific gravity of 1.0.				
1 and 1-1/4 inch	5	20	60	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. References to specific gravity refer to liquid specific gravity and are referenced to water which is assumed to have a specific gravity of 1.0.

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. No piping shall be supported from the pipe above.

4. 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 Table 2.

B. 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.

End of Section

SECTION 15180 - VALVE AND GATE ACTUATORS

PART 1 - GENERAL

1.1 SCOPE

A. This section covers furnishing manual and powered valve and gate 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 eccentric plug valves shall conform to the applicable requirements of ANSI/AWWA C504.

3. Except as modified or supplemented herein, actuators for stainless steel slide gates shall conform to the applicable requirements of ANSI/AWWA C561.

E. Power Supply

1. Power supply to electric actuators will be as indicated in the valve and gate 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 respective Valve or Gate schedules.

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.

C. Gate Actuators

1. Actuators shall be sized to produce the torque or thrust required to operate the gate when subject to the seating and unseating operating heads as indicated in the respective gate schedules.

2. Both the design head and the operating head shall be measured from the surface of the liquid to the center line of the gate.

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 VALVE MANUAL ACTUATORS

A. General

1. Manual actuators of the types listed in the valve specifications or schedules shall be provided by the valve manufacturer.

2. Unless otherwise indicated or specified, each geared manual actuator shall be equipped with an operating handwheel.

3. The direction of rotation of the wheel, wrench nut, or lever to open the valve shall be to the left (counterclockwise). Each valve body or actuator shall have cast thereon the word "Open" and an arrow indicating the direction to open.

4. The housing of traveling-nut type actuators shall be fitted with a removable cover which shall permit inspection and maintenance of the operating mechanism without removing the actuator from the valve. Travel limiting devices shall be provided inside the actuator for the open and closed positions. Travel limiting stop nuts or collars installed on the reach rod of traveling-nut type operating mechanisms shall be field adjustable and shall be locked in position by means of a removable roll pin, cotter pin, or other positive locking device. The use of stop nuts or adjustable shaft collars which rely on clamping force or setscrews to prevent rotation of the nut or collar on the reach rod will not be acceptable.

5. Each actuator shall be designed so that shaft seal leakage cannot enter the actuator housing.

6. Valves for throttling service shall be equipped with an infinitely variable locking device or a totally enclosed gear actuator.

7. Actuators shall produce the required torque with a maximum pull of 80 lbs on the lever, handwheel, or chain. Actuator components shall withstand, without damage, a pull of 200 lbs on the handwheel or chainwheel or an input of 300 foot-lbs on the operating nut.

B. Handwheels

1. Handwheel diameters shall be at least 8 inches but not more than 24 inches for 30 inch and smaller valves.

2.4 GATE MANUAL ACTUATORS

A. General

1. Manual actuators of the types listed in the gate schedules shall be provided by the gate manufacturer. Unless otherwise specified, actuators shall conform to ANSI/AWWA C560.

2. All bearings and gears shall be totally enclosed in a weathertight housing having a sufficient number of fittings to permit periodic lubrication of all internal moving components without partial or total disassembly of the mechanism. The pinion shaft of crank-operated mechanisms shall be supported by roller bearings or needle bearings.

3. The direction of rotation of the wheel, crank, or wrench nut to open the gate shall be to the left (counterclockwise).

4. Actuators for rising stem self-contained gates shall be designed for mounting directly on the frame yoke.

5. When indicated in the gate schedules, crank-operated actuators shall be suitable for operation with a portable actuator specified herein. A suitable adapter coupling shall be furnished with each crank actuator to couple the portable actuator to the crank actuator pinion shaft as required.

B. Wall Brackets

1. Wall brackets shall be provided to support manual actuators in the locations indicated on the Drawings or indicated in the respective gate schedules. The horizontal face of the bracket shall be predrilled to accept the actuator and the stem without modification. The top of the bracket shall extend sufficiently to bear on and transfer thrust loads to the top of the supporting structure.

C. Stem Covers

1. Rising stem manual actuators shall be provided with a stem cover as indicated in the gate schedules. Stem covers shall conform to Section 4.4 of ANSI/AWWA C560.

2. Plastic Covers

a. Covers shall be constructed of transparent plastic pipe and shall be furnished with an end cap, condensation vents, and a clear mylar position-indicating marking tape.

The marking tape shall be adhesive backed and shall be permanently marked and calibrated in feet and inches. The tape shall be applied to the stem cover after the gate has been installed and shall be so positioned that the height of the slide will be indicated by reference to the top of the stem.

2.5 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", EIM "TEC2/TEC2000", Limitorque "MX", or Rotork "IQ Series", without 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.

2. Actuators for valves or gates listed for modulating service in the valve and gate schedules shall be provided with a control module for position modulating type service. The control module shall be mounted within the controls compartment. The module shall accept a standard 4-20 mA dc analog input signal with a load impedance of not greater than 400 ohms. The control module shall contain adjustments for span, zero, gain, and deadband. Non-networked modulating actuators shall have a 4 to 20 mA output signal proportional to valve or gate position.

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. Valve or gate opening, closing, or moving.
b. Thermostat tripped, phase loss.
c. Motor tripped on torque in mid travel, motor stalled.
d. Remote mode selected.
e. Local mode selected.

J. Remote Electric Actuator Control Station

1. Each actuator shall be furnished with a remote control station as indicated in the valve schedules and on the Drawings. The control station shall include red and green indicating lights for valve position status, and Local-Off-Remote and Open-Close selector switches for control.

2. Power for the remote control station shall be provided from its respective actuator unit. The remote control station shall be rated NEMA 4X. Each device mounted on the remote control station shall have an engraved label or escutcheon plate indicating its respective function. The remote control station shall have an engraved tag indicating the tag number or description of the respective actuated valve or gate.

2.6 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 and on gates in accordance with the Gate 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.

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 be 304/316 stainless steel and comply with Anchorage in Concrete and Masonry section, except smaller than 3/4 inch 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) 277/480V, three-phase — brown, orange, yellow, and gray

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. 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.

D. 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.

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.

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 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 (Figure 2- 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, 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 signalling 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) .

2.2 RACEWAY

A. Conduit and cable tray shall be as described in the following paragraphs:

B. Rigid Nonmetallic (PVC) Conduit

1. PVC conduit shall be heavy wall, Schedule 40 and 80, UL labelled for aboveground and underground uses, and shall conform to NEMA TC-2 and UL 651.

C. PVC-Coated Rigid Aluminum Conduit

1. The conduit shall be rigid aluminum. Before the PVC coating is applied, the outer aluminum surfaces shall be coated with a primer to obtain a bond between the aluminum substrate and the coating. The PVC coating shall be bonded to the primed outer surface of the conduit. The bond on conduit and fittings shall be stronger than the tensile strength of the PVC coating. The thickness of the PVC coating shall be at least 40 mils.

2. A chemically cured two-part urethane coating, at a nominal 2 mil thickness, shall be applied to the interior of all conduit and fittings. The coating shall be sufficiently flexible to permit field bending the conduit without cracking or flaking of the coating.

3. Every female conduit opening shall have a PVC sleeve extending one conduit diameter or 2 inches, whichever is less, beyond the opening. The inside diameter of the sleeve shall be the same as the outside diameter of the conduit before coating. The wall thickness of the sleeve shall be at least 40 mils.

4. All fittings, condulets, mounting hardware, and accessories shall be PVC-coated. All hollow conduit fittings shall be coated with the interior urethane coating described above. The screw heads on condulets shall be encapsulated by the manufacturer with a corrosion-resistant material.

5. PVC coated rigid aluminum conduit shall be manufactured by Calbond, Ocal, or Robroy Industries.

D. 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.

2.3 WIRING DEVICES, BOXES, AND FITTINGS

A. Exposed conduit systems shall have surface-mounted switches.

B. Conduit Boxes and Fittings

1. In applications utilizing aluminum conduit systems, aluminum boxes and fittings manufactured by Crouse-Hinds, Appleton, or O Z Gedney shall be installed.

2. Hub arrangements on threaded fittings shall be the most appropriate for the conduit arrangement to avoid unnecessary bends and fittings.

C. Device Plates.

1. Aluminum device plates shall be used on surface mounted outlet boxes where weatherproof plates are not required.

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. Engraved device plates, where required, shall be manufactured by Leviton, or equal.

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 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”.

2.4 JUNCTION BOXES, PULL BOXES, AND WIRING GUTTERS

A. Indoor boxes (larger than switch, receptacle, or fixture type) and gutters shall be constructed of aluminum and shall be rigidly supported by 304/316 stainless hardware and framing materials, including nuts and bolts.

B. Indoor boxes and gutters in corrosive areas indicated on the Drawings and outdoor boxes and gutters shall be NEMA Type 4X aluminum or stainless steel and shall be rigidly supported by 304/316 stainless steel framing materials. Mounting hardware, which includes nuts, bolts, and anchors, shall be 304/316 stainless steel. All damaged coatings shall be repaired according to the manufacturer's instructions.

C. 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.

D. 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.

2.5 LIGHTING FIXTURES

A. Lighting fixtures shall be furnished as described in the fixture schedule and as indicated on the Drawings. Lighting fixtures shall be furnished complete with lamps. Lighting fixtures shall be provided with disconnects in accordance with NEC requirements.

B. Electronic Drivers

1. Electronic drivers furnished with LED type lighting fixtures shall be certified as meeting requirements of ANSI C82.77 with a THD level of not more than 20 percent.

2.6 DISCONNECT SWITCHES

A. Unless otherwise specified, each disconnect switch shall be 3 pole, nonfusible, 600 volts, with a continuous current rating as indicated on the Drawings.

B. Where indicated on the Drawings, fused switches shall be furnished complete with fuses. Fuse sizing shall be as indicated on the Drawings, as required by the results of the protective device study, or as recommended by the respective protected equipment manufacturer.

C. Switches located indoors shall have NEMA type enclosure designations as required by the locations where they will be installed. Switches located outdoors shall have NEMA Type 4X enclosures. Switches in chlorine rooms, or in other areas where contact with caustic substances may occur, shall have NEMA Type 4X enclosures of molded reinforced polyester.

D. Switches shall have high conductivity copper, visible blades; nonteasible, positive, quick-make, quick-break mechanisms; and switch assembly plus operating handle as an integral part of the enclosure base. Each switch shall have a handle whose position is easily recognizable and which can be locked in the "Off" position with three padlocks. The "On" and "Off" positions shall be clearly marked.

E. All switches shall be UL listed and horsepower rated, and shall meet the latest edition of NEMA KS1. Switches shall have defeatable door interlocks that prevent the door from being opened while the operating handle is in the "On" position.

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 CABLE INSTALLATION

A. General

B. 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.

1. Stranded conductor cable shall be terminated by lugs or pressure type connectors. Wrapping stranded cables around screw type terminals is not acceptable.

2. 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.

3. Splices may be made only at readily accessible locations.

4. Cable terminations and splices shall be made as recommended by the cable manufacturer for the particular cable and service conditions.

5. Cable shall not be pulled tight against bushings nor pressed heavily against enclosures.

6. Cable-pulling lubricant shall be compatible with all cable jackets; shall not contain wax, grease, or silicone; and shall be Polywater "Type J".

7. Where necessary to prevent heavy loading on cable connections, in vertical risers, the cable shall be supported by Kellems, or equal, woven grips.

8. Spare cable ends shall be taped, coiled, and identified.

9. Cables shall not be bent to a radius less than the minimum recommended by the manufacturer.

10. All cables in one conduit, over 1 foot long, or with any bends, shall be pulled in or out simultaneously.

11. 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.

12. 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.

3.3 RACEWAY INSTALLATION

A. Contractor shall be responsible for routing all raceway. This shall include all conduits indicated on the one-lines, riser diagrams, 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 all exposed indoor locations, except corrosive areas indicated on the Drawings, and in floor slabs, walls, and ceilings of hazardous (classified) locations, shall be rigid aluminum. Exposed conduit shall be rigidly supported by 304/316 stainless steel hardware and framing materials, including nuts and bolts.

b. Not used.

c. Conduit installed in all exposed outdoor locations shall be rigid aluminum, rigidly supported by 304/316 stainless steel framing materials. Mounting hardware, which includes nuts, bolts, and anchors, shall be 304/316 stainless steel. All damaged coatings shall be repaired according to the manufacturer's instructions.

e. Terminations and connections of rigid aluminumshall be taper threaded. Conduits shall be reamed free of burrs and shall be terminated with conduit bushings. Conduits shall be reamed free of burrs and shall be terminated with conduit bushings. An anti-seize compound shall be used on all conduit connections to prevent galling and seizure.

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. Not used.

j. Rigid Schedule 40 PVC conduit shall have supports and provisions for expansion as required by NEC Article 352.

k. Metallic conduit connections to sheet metal enclosures shall be securely fastened by locknuts inside and outside.

l. Rigid Schedule 40 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.

m. Not used.

n. Conduits that cross structural joints where structural movement is allowed shall be fitted with concretetight and watertight expansion/deflection couplings, suitable for use with metallic conduits and rigid Schedule 40 or 80 PVC conduits. The couplings shall be Appleton Type DF, Crouse-Hinds Type XD, or O-Z Type DX.

o. Conduit shall be clear of structural openings and indicated future openings.

p. Conduits through roofs or metal walls shall be flashed and sealed watertight.

q. 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.

r. Conduits shall be capped during construction to prevent entrance of dirt, trash, and water.

s. Not used.

t. Not used.

u. Not used.

v. 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.

w. Conduit shall not be routed across the surface of a floor, roof, or walkway unless approved by Engineer.

x. PVC-coated rigid aluminum conduit shall be threaded and installed as recommended by the conduit manufacturer's installation procedure using appropriate tools.

y. All conduits that enter enclosures shall be terminated with acceptable fittings that will not affect the NEMA rating of the enclosure.

z. Conduit which turns out of concrete slabs or walls, shall be connected to a 90 degree elbow of PVC-coated rigid aluminum conduit before it emerges. Conduits shall have PVC-coated rigid aluminum 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 aluminum 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. Underground conduit bend radius shall be at least 2 feet at vertical risers and at least 3 feet elsewhere.
e. Underground conduits and conduit banks shall have at least 2 feet of earth cover, except where indicated otherwise.
f. 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.
g. Underground nonmetallic conduits, which turn out of concrete or earth in outdoor locations, shall be connected to 90 degree elbows of PVC-coated rigid aluminum conduit before they emerge.
h. Underground conduits shall be sloped to drain from buildings to manholes.
i. 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 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 may be reused subject to the concurrence of Engineer and compliance with the following requirements:

    a. A wire brush shall be pulled through the conduit to remove any loose debris.
    b. A mandrel shall be pulled through the conduit to remove sharp edges and burrs.

3.4 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. Galvanized or cadmium plated, threaded, malleable iron boxes and fittings shall be installed in concrete walls, ceilings, and floors; in the outdoor faces of masonry walls; and in all locations where weatherproof device covers are required. These boxes and fittings shall also be installed in exposed rigid aluminum conduit systems.

2. PVC coated boxes and fittings shall be installed in PVC coated conduit systems.

C. Device Plates

1. Oversized plates shall be installed where standard-sized plates do not fully cover the wall opening.

D. Wall Switches

1. Wall switches shall be mounted 3'-6" above floor or grade.

2. After circuits are energized, all wall switches shall be tested for proper operation.

3.5 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.

3.6 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. n/a
   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 , 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. Not used.
   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. 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.

3.7 LIGHTING FIXTURE INSTALLATION

A. The Drawings indicate the general locations and arrangements of the lighting fixtures. Fixtures in rows shall be aligned both vertically and horizontally unless otherwise specified. Fixtures shall be clear of pipes, mechanical equipment, structural openings, indicated future equipment and structural openings, and other obstructions.

B. Conduit and wire for lighting fixture installation is not shown on the Drawings and shall be sized, furnished and installed by Contractor. Conductors shall be minimum 12 AWG and conduit shall be minimum 3/4 inch for lighting fixture installation.

3.8 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.

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 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, 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

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. 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.

B. 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. 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.

D. 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

SECTION 16220 - COMMON MOTOR REQUIREMENTS FOR PROCESS EQUIPMENT

PART 1 - GENERAL

1.1 SCOPE

A. This section covers single and three-phase, small (fractional) and medium (integral) horsepower, alternating current motors rated 500 horsepower and less (NEMA MG1).

B. Motors shall be designated and coordinated with the driven equipment and shall be located as indicated on the Drawings.

1.2 GENERAL

A. Motors furnished under driven equipment Specification sections 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 the Engineer.

B. Where applicable, individual motor data sheets have been developed which specify additional requirements for specific motors.

C. General Equipment Stipulations

1. The General Equipment Stipulations section shall apply to all motors, unless otherwise specified. 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. Governing Standards

1. Motors furnished under this section shall be designed, constructed, and tested in accordance with the latest version of NEMA MG 1, NEMA MG 10, and IEEE 112, Test Method B.

F. Nameplates

1. All motor nameplate data shall conform to NEMA MG 1 requirements.

1.3 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 motor shall be submitted in accordance with the Submittals Procedures section. The drawings and data shall include, but shall not be limited to, the following:

B. Drawings and Data – Each Motor

1. Name of manufacturer.

2. Type and model.

3. Type of bearing and method of lubrication.

4. Rated size of motor, hp , and service factor.

5. Temperature rise and insulation rating.

6. Full load rotative speed.

7. Net weight.

8. Efficiency at full, 3/4, and 1/2 load.

9. Full load current.

10. Locked rotor current.

11. Space heater wattage, where applicable.

12. Motor temperature switch data, where applicable.

13. Motor Shaft Grounding Ring data, where applicable.

14. RTD data, where applicable.

C. Seismic Design Requirement Certifications

1. Confirmation of compliance with the requirements of the Meteorological and Seismic Design Criteria section.

1.4 OPERATION AND MAINTENANCE DATA AND MANUALS

A. Adequate operation and maintenance information shall be supplied. Operation and maintenance manuals shall be submitted in accordance with the Submittals Procedures section.

B. Operation and maintenance manuals shall include the following:

1. Assembly, installation, alignment, adjustment, and checking instructions.

2. Lubrication and maintenance instructions.

3. Guide to troubleshooting.

4. Parts lists and predicted life of parts subject to wear.

5. Outline, cross-section, and assembly drawings; engineering data; and wiring diagrams.

6. Test data and performance curves, where applicable.

PART 2 - PRODUCTS

2.1 SERVICE CONDITIONS

A. Service conditions for motors shall be as specified in the driven equipment Specification sections. Motors shall be designed for special conditions such as area classification, altitude, frequent starting, intermittent overload, high inertia, mounting configuration, or service environment. Where site elevation and ambient temperature is not specified in the driven equipment Specification sections, the motors shall be designed for the following.

Site elevation	Below 3,300 ft
Ambient temperature	40 °C

B. Unless specified otherwise, all motors shall be designed for full voltage starting and to operate from an electrical system that may have a maximum of 5 percent voltage distortion according to IEEE 519.

C. The number of starts per hour for motors shall be rated for the load cycling requirements of NEMA MG 10.

2.2 PERFORMANCE AND DESIGN REQUIREMENTS

A. Unless otherwise specified in the attached motor data sheet(s), design and construction of each general-purpose motor shall be as specified herein. Motor voltage, frequency, speed, service factor, and insulation class shall be as follows.

Motor voltage.	460, 3 phase for ½ horsepower and larger, 120, single phase for smaller than ½ horsepower
Frequency.	60 Hz
Speed.	Constant speed
Service factor.	1.15
Insulation class and temperature rise above 40° C design ambient (by resistance method.	Class F with 90° C rise at 1.15 SF
Enclosure.	Totally enclosed fan cooled

Main conduit box sized to include.	Main motor leads and space heater leads where space heaters are specified

B. Nameplate Horsepower

1. Motor nameplate horsepower shall be equal to or greater than the maximum load imposed by the driven equipment.

C. Enclosures

1. All motors shall be self-ventilated. All self-ventilated open type motors, including those with dripproof, splashproof, and weather protected enclosures, and the fan covers of totally enclosed fan cooled motors shall meet NEMA MG 1 requirements for a fully guarded machine.

2. Totally Enclosed Motors

a. Totally enclosed motors shall be furnished with drain holes and rotating shaft seals. Frames, bearing brackets, external terminal housings, and fan covers for fan cooled motors shall be cast iron. External cooling fans for fan cooled motors shall be fabricated of brass, bronze, aluminum alloy containing not more than 0.2 percent copper, malleable iron, or plastic. All plastic fans shall be fabricated of a reinforced thermosetting plastic and shall be UL approved.

3. Motors for Hazardous Locations

a. Motors for hazardous locations shall be in accordance with the NEC and of the correct type enclosures for the particular service as specified in NEMA MG 1. Motors shall meet the requirements of UL 674.

D. Main Conduit Boxes

1. The main conduit box shall be in accordance with NEMA MG 1. The main conduit boxes shall be diagonally split for easy access to the motor leads, and designed for rotation in 90-degree increments. A gasket shall be furnished between the halves of the box. Conduit openings in the main conduit box shall match the size and quantity of conduits indicated on the one line Drawings.

2. The main conduit box shall be oversized at least one size larger than NEMA standard. The main conduit box shall be sized for all indicated accessory leads.

3. Motors furnished in NEMA 320 frame series and larger shall have conduit boxes designed and constructed to permit motor removal after installation without disconnecting raceways.

E. Leads

1. Motor power leads shall be wired into the main conduit box. Unless otherwise specified, space heater leads shall be wired into the main conduit box. All motor leads and their terminals shall be permanently marked in accordance with the requirements of NEMA MG 1, Part 2. Each lead marking shall be visible after taping of the terminals.

F. Terminals

1. Cable type leads shall be provided with Burndy Type YA or acceptable equal compression type connectors.

G. Grounding Connections

1. All motors shall be furnished with a ground connection.

H. Bearings

1. All bearings shall be self-lubricating, shall have provisions for relubrication, and shall be designed to operate in any position or at any angle.

2. Motor bearings shall be antifriction type with L_{10} life rating of 40,000 hours in accordance with ABMA Standards.

3. All bearing mountings shall be designed to prevent the entrance of lubricant into the motor enclosure or dirt into the bearings, and shall be fitted with pipes, drain plugs, and fittings arranged for safe, easy relubrication from the outside of the motor while the motor is in service, as necessary.

I. Rotors

1. All induction motors shall have squirrel-cage rotors adequately sized to avoid overheating during acceleration of the motor and driven equipment. Rotors shall be dynamically balanced to 0.08 in./sec or less.

J. Shafts

1. Shafts shall be furnished with corrosion resistant treatment or shall be of a corrosion resistant material.

K. Torque Characteristics

1. Motors rated 200 horsepower and less shall have torques and locked-rotor current in accordance with NEMA MG 1, Part 12.

L. Motor Space Heaters

1. Unless otherwise specified in the attached motor data sheet(s), motors 1 horsepower and larger shall be provided with a space heater element sized to prevent condensation on the core and windings. The space heaters shall be isolated or so located as to prevent heat damage to adjacent painted surfaces and shall be suitable for 120 volt, 60 Hz, single phase power supply.

M. Temperature Sensing Devices

1. Each motor controlled by an adjustable frequency drive or reversing motor starter shall be furnished with at least one automatic reset winding temperature switch per phase. Temperature switch contacts shall be normally closed and rated 5 amps at 120 volts ac.

The contacts shall be wired in series with the end leads brought out to the motor terminal box.

2. An auxiliary conduit box shall be provided for termination of temperature switch wiring.

N. Assembly

1. All motors shall be completely assembled with the driven equipment, lubricated, and ready for operation.

O. Efficiency

1. Unless otherwise specified in the attached motor data sheet(s), motors shall be premium efficiency type and shall have a NEMA nominal efficiency nameplate value equal to or greater than values indicated in the following table. Efficiency shall be determined in accordance with IEEE 112, Test Method B.

2. Vertical motors shall have efficiency values equal to or greater than those indicated in the following table minus 0.50.

Motor		Nominal Efficiency Values				Nominal Efficiency Values			
kW	hp	Open Drip Enclosure				TEFC Enclosure			
		3600 rpm	1800 rpm	1200 rpm	900 rpm	3600 rpm	1800 rpm	1200 rpm	900 rpm
0.7	1	84.0	85.5	82.5	75.0	77.0	85.5	82.5	75.5
1.1	1.5	84.0	86.5	86.5	78.0	84.0	86.5	87.5	80.0
1.5	2	85.5	86.5	87.5	86.5	85.5	86.5	88.5	85.5
2.2	3	85.5	89.5	88.5	89.5	87.0	89.5	89.5	86.5
3.7	5	86.5	89.5	89.5	89.5	88.5	89.5	89.5	85.5
5.6	7.5	88.5	91.0	90.2	88.5	90.0	91.7	91.0	86.5
7.5	10	89.5	91.7	91.7	91.0	91.0	91.7	91.0	91.0
11.2	15	90.2	93.0	91.7	91.0	91.0	92.4	92.0	91.0
14.9	20	91.7	93.0	92.4	92.0	92.0	93.0	92.0	91.0
18.7	25	92.4	93.6	93.0	92.0	92.0	93.6	93.0	91.0
22.4	30	93.0	94.1	93.6	93.0	92.4	93.6	93.0	93.0
29.8	40	93.0	94.1	94.1	93.0	92.4	94.1	94.1	93.0
37.3	50	93.0	94.5	94.1	93.0	93.0	94.5	94.1	93.0
44.8	60	93.6	95.0	94.5	94.0	93.6	95.0	94.5	93.0
56	75	94.0	95.0	95.0	94.0	93.6	95.4	95.0	94.0
74.6	100	94.5	95.4	95.0	95.0	94.1	95.4	95.0	94.0
93.2	125	95.0	95.4	95.0	95.0	95.0	95.4	95.0	94.0

Motor		Nominal Efficiency Values				Nominal Efficiency Values			
kW	hp	Open Drip Enclosure				TEFC Enclosure			
		3600 rpm	1800 rpm	1200 rpm	900 rpm	3600 rpm	1800 rpm	1200 rpm	900 rpm
112	150	95.0	95.8	95.4	95.0	95.0	95.8	95.8	94.0
149	200	95.4	95.8	95.4	95.0	95.4	96.2	95.8	94.1
186	250	95.0	95.8	95.4	95.0	95.8	96.2	95.8	94.5
224	300	95.4	95.8	95.4		95.8	96.2	95.8	
261	350	95.4	95.8	95.4		95.8	96.2	95.8	
298	400	95.8	95.8	95.8		95.8	96.2	95.8	
336	450	95.8	96.2	96.2		95.8	96.2	95.8	
373	500	95.8	96.2	96.2		95.8	96.2	95.8	

2.3 ACCESSORIES.

A. Special Tools and Accessories

1. Motors requiring periodic repair and adjustment shall be furnished complete with all special tools, instruments, and accessories required for proper maintenance. Each motor shall be provided with lifting eyebolts or lugs and appropriate fittings for adding bearing lubricant. Grease lubricated units shall be provided with a means of venting the casing. Oil lubricated units shall be provided with constant level oilers or with sight glasses arranged to indicate operating and static oil levels.

2.4 ANCHORS

A. Contractor shall furnish suitable anchors for each item of equipment as required for driven equipment.

2.5 BALANCE

A. 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 displacement (peak-to-peak), as measured at any point on the machine, shall not exceed the limits as required by NEMA MG 1. 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.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Each motor shall be installed in accordance with the Equipment Installation section.

End of Section

SECTION 16670 - LIGHTNING PROTECTION FOR STRUCTURES

PART 1 - GENERAL

1.1 SCOPE

A. This section covers furnishing the design of lightning protection systems and the furnishing and installation of lightning protection equipment for the following structures:

1. Existing Weir Gate Structure.

B. Lightning protection systems shall be furnished, installed, and tested as specified. Lightning protection equipment shall meet the requirements specified herein.

C. Lightning protection systems shall consist of, but not be limited to, air terminals; main, bonding, and down conductors; ground terminals; and all required connectors and fittings required to complete the system.

D. The lightning protection system shall include the bonding of all guardrails at the existing weir gate structure.

1.2 GENERAL

A. Contractor shall furnish all installation drawings, tools, equipment, materials, and supplies and shall perform all labor and obtain all inspections to complete the work as specified, and in compliance with all codes, standards, and regulations.

B. Contractor shall provide coordination with other contractors and supervision of installation as needed during construction.

C. The design of the system shall include determination of the overall lightning hazard for the geographic location of the project and for the structures, the selection of Class I and/or Class II materials, the need of corrosion protection for the copper and/or aluminum components used, and consideration of other pertinent factors. The design shall produce a zone of protection from lightning to prevent personal injury, structural damage, and equipment downtime.

D. 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 UL unless exceptions are noted by Engineer.

E. The system shall be installed by an installer who has UL listing and subscribes to the UL Follow-Up Service.

F. General Equipment Stipulations

1. The General Equipment Stipulations section shall apply to all equipment furnished under this section. If requirements in this section differ from those in the General Equipment Stipulations section, the requirements specified herein shall take precedence.

G. Seismic Design Requirements

1. Seismic design requirements for products specified herein shall be as indicated in the Meteorological and Seismic Design Criteria section.

H. Governing Standards

1. All system components furnished under this section shall be designed in accordance with ANSI/UL 96 - Lightning Protection Components. All lightning protection systems furnished under this section shall be designed, constructed, and tested in accordance with UL 96A – Installation Requirements for Lightning Protection Systems and ANSI/NFPA 780 – Standard for the Installation of Lightning Protection Systems.

2. Lightning protection systems shall be bonded to grounding electrode systems in accordance with the National Electrical Code.

I. Workmanship and Materials

1. 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.

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, unless required by tests.

1.3 SUBMITTALS

A. Drawings and Data

1. Complete certification of design calculations; assembly, and installation drawings; together with complete engineering data covering the materials used and the parts, devices, and accessories forming the system, shall be submitted in accordance with the Submittals Procedures section.

B. Meteorological and Seismic Design Criteria Compliance

1. Submit confirmation of compliance with the requirements of the Meteorological and Seismic Design Criteria section.

1.4 QUALITY ASSURANCE

A. The lightning protection system shall be inspected and tested after installation by conducting continuity and ground resistance tests as well as a visual inspection. Inspection results and test data shall be submitted in accordance with the Submittals Procedures section. Upon completion of the installation, Contractor shall apply for and deliver the UL Master Label Certificate of Inspection for each structure/building.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. The system components shall be manufactured by a company that has been specializing in the design and manufacture of UL listed lightning protection equipment for at least 5 years.

2.2 MATERIALS

A. All manufactured and fabricated components shall conform to NFPA 780 Class I or Class II as needed for the structures on which they will be installed. The system components shall be fabricated from the following metals:

Conductors	Copper.
Air Terminals	Copper or bronze.
Grounding Electrodes	Copper clad steel.
Fasteners	Copper or bronze.
Bimetallic Fasteners	Bronze and aluminum.

B. Aluminum conductors and air terminals shall be mounted on aluminum surfaces only.

C. All materials furnished for the lightning protection system shall bear the inspection label of UL.

PART 3 - EXECUTION

3.1 INSTALLATION

A. The lightning protection system shall be installed in a neat and inconspicuous manner so all components will blend in with the appearance of the building. All conductors shall be concealed or semi-concealed during construction using methods recommended in NFPA 780 and UL 96A.

B. Air terminals shall have base supports designed for the surface on which they are used and shall be securely anchored. All exposed metal eave troughs, roof vents, guy wires, antennas, and air handling equipment shall be bonded to the lightning protection system in such a way that two paths to ground are provided.

C. The lightning protection system shall be bonded to structure/building electrical ground rings wherever they are available.

End of Section

APPENDIX A – GEOTECHNICAL REPORT
(*for information only*)

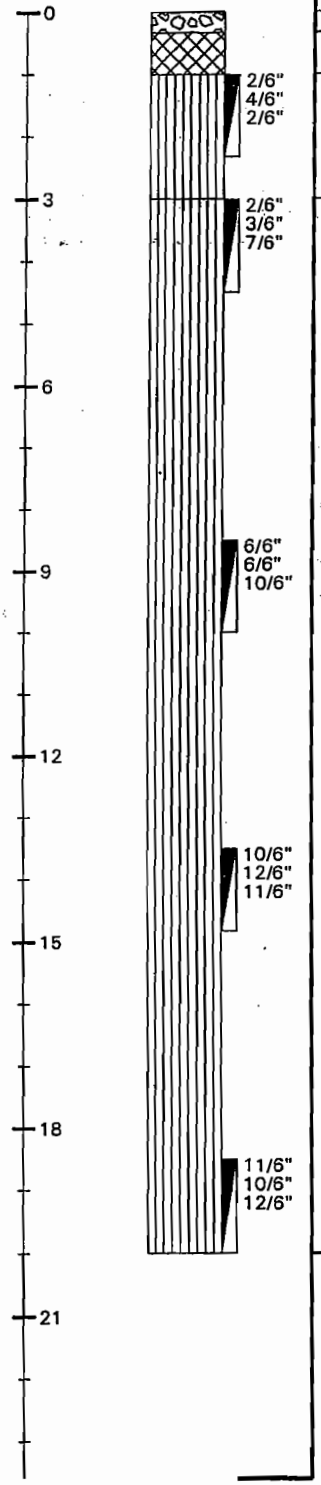
BORING LOGS B1 THRU B5

LOG OF TEST BORING

BORING B-1

PROJECT: Turkey Creek Pumping Station
CLIENT: Camp, Dresser & McKee
PROJECT NO.: 304160G **START DATE:** 9/20/04
BORING LOCATION: See Boring Location Plan
METHOD OF DRILLING: 3 1/4" I.D. hollow stem auger
INITIAL WATER: None **DELAYED WATER TABLE:**

DATE: 4/11/2005
ELEVATION:
FINISH DATE: 9/20/04
LOGGER: TRS
CAVING:
DATE CHECKED:



Elevation/ Depth	USCS	Description	Sample # & Type	Moist-ure, %	Density pcf	LL	PI	Qu, psf	Qp, tsf
	C	Asphaltic concrete, 4"							
	Fill	Fill, clayey gravel							
	ML	Clayey silt, gray, some fine sand, trace gravel, moist, loose	1, SS						
		Sandy silt, grayish brown, moist, medium dense	2, SS						
		With trace clay							
			3, SS						
	ML								
			4, SS						
			5, SS						
		Drilling discontinued at 20.0'							

Notes:

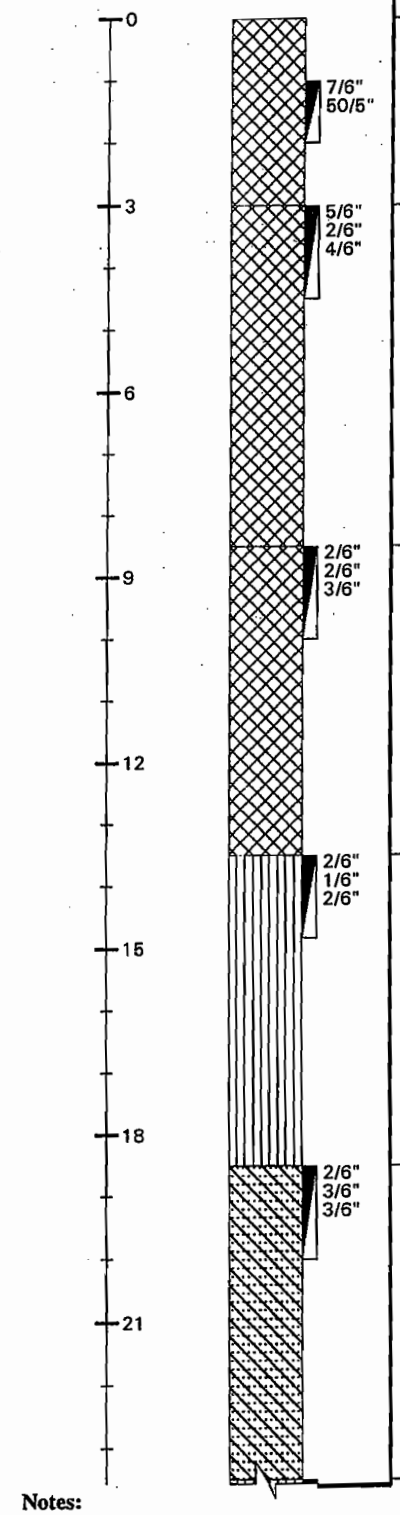
Figure Number 1

LOG OF TEST BORING

BORING B-2

PROJECT: Turkey Creek Pumping Station
CLIENT: Camp, Dresser & McKee
PROJECT NO.: 304160G **START DATE:** 9/20/04
BORING LOCATION: See Boring Location Plan
METHOD OF DRILLING: 3 1/4" I.D. hollow stem auger/wash bore
INITIAL WATER: 37.0' **DELAYED WATER TABLE:**

DATE: 4/11/2005
ELEVATION:
FINISH DATE: 9/20/04
LOGGER: TRS
CAVING:
DATE CHECKED:



Elevation/ Depth	Soil Symbols Sampler Symbols & Field Test Data	USCS	Description	Sample # & Type	Moist-ure, %	Density pcf	LL	PI	Qu, psf	Qp, tsf
		Fill	Fill, lean clay, dark grayish brown, some fine sand and silt, trace rock fragments, moist, medium to stiff	1, SS						
		Fill	Fill, clayey silt, grayish brown, some fine sand, moist, loose	2, SS						
		Fill	Fill, clayey sand, grayish brown, some silt, trace rock fragments, moist, loose	3, SS						
		ML	Clayey silt, grayish brown, some fine sand, moist, loose	4, SS						
		SC	Clayey sand, grayish brown, some silt, trace rock fragments, moist, loose	5, SS				NP		

Notes:

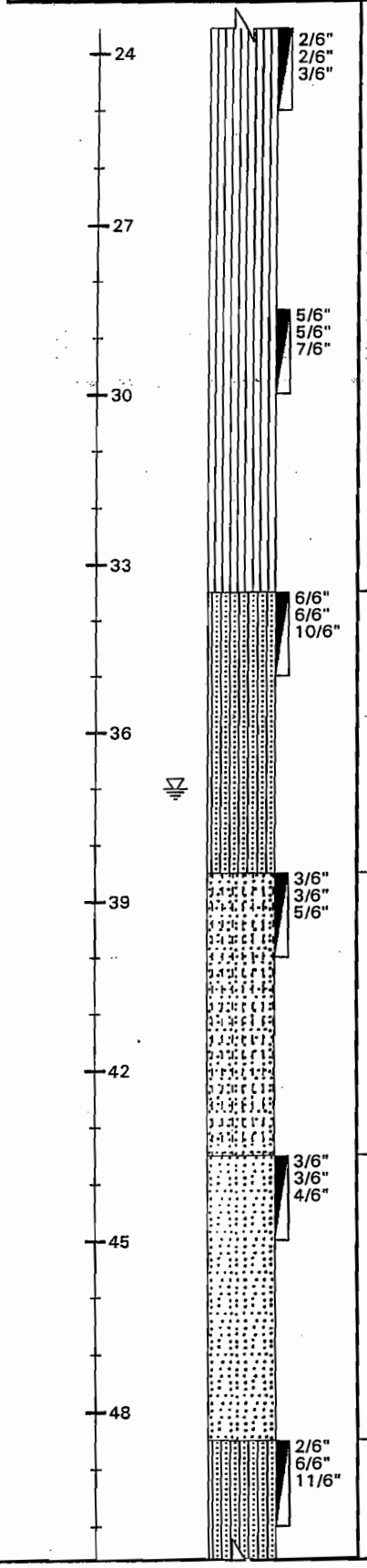
Figure Number 2

LOG OF TEST BORING

BORING B-2

PROJECT: Turkey Creek Pumping Station

DATE: 4/11/2005



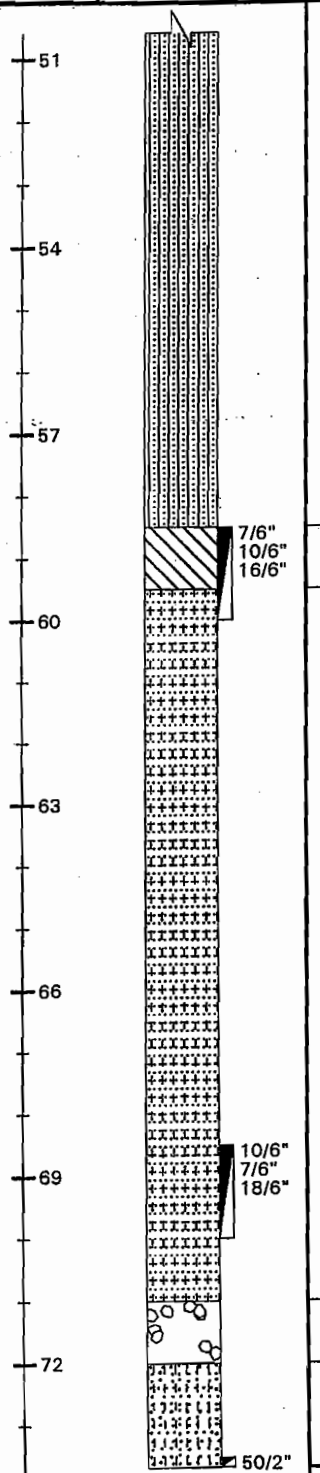
Elevation/ Depth	USCS	Description	Sample # & Type	Moisture, %	Density pcf	LL	PI	Qu, psf	Qp, tsf
		Sandy silt, light brown, contains thin lean clay layer, moist, loose	6, SS						
	ML	Becoming medium dense	7, SS						
	SM	Silty fine sand, very moist, medium dense	8, SS						
	SP-SM	Poorly graded fine to medium sand with silt, contains thin gray fat clay layers, trace cobbles, wet, loose	9, SS						
	SP	Poorly graded medium to coarse sand, contains few thin gray clay layers, wet, loose	10, SS						
		Silty fine sand, gray, wet, medium dense	11, SS						

LOG OF TEST BORING

BORING B-2

PROJECT: Turkey Creek Pumping Station

DATE: 4/11/2005



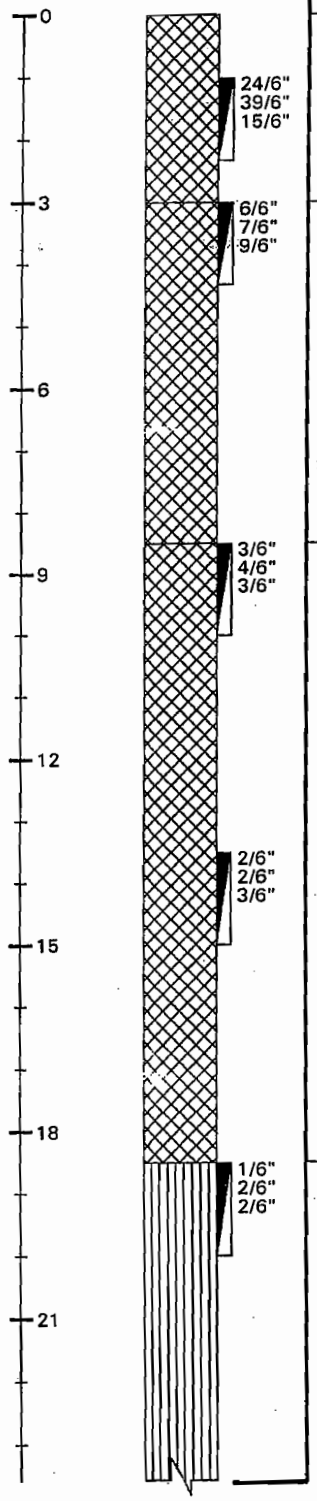
Elevation/ Depth	Soil Symbols Sampler Symbols & Field Test Data	USCS	Description	Sample # & Type	Moist-ure, %	Density pcf	LL	PI	Qu, psf	Qp, tsf
		SM								
		CH	Fat clay, gray, moist, stiff	12, SS			76	53		
		SW-SM	Well graded sand, with silty and gravel, wet, medium dense	13, SS						
		Bldr	Limestone boulder							
		SP-SM	Poorly graded medium to coarse sand with silt, trace fine gravel, wet. medium dense	14, SS						
			Sampler refusal on probable boulder at 73.7'							

LOG OF TEST BORING

BORING B-3

PROJECT: Turkey Creek Pumping Station
CLIENT: Camp, Dresser & McKee
PROJECT NO.: 304160G **START DATE:** 9/21/04
BORING LOCATION: See Boring Location Plan
METHOD OF DRILLING: 3 1/4" I.D. hollow stem auger/wash bore
INITIAL WATER: 38.0' **DELAYED WATER TABLE:**

DATE: 4/11/2005
ELEVATION:
FINISH DATE: 9/21/04
LOGGER: TRS
CAVING:
DATE CHECKED:



Elevation/ Depth	Soil Symbols Sampler Symbols & Field Test Data	USCS	Description	Sample # & Type	Moist-ure, %	Density pcf	LL	PI	Qu, psf	Qp, tsf
		Fill	Fill, brown lean clay with sand, a little gravel, trace cobbles, slightly moist, stiff	1, SS						
		Fill	Fill, olive, gray, lean to fat clay, with sand, rock fragments, moist, stiff	2, SS						
		Fill	Fill, poorly graded light brown fine sand, trace clay, slightly moist, medium dense	3, SS						
		Fill	With trace cinders	4, SS						
			Clayey silt, grayish brown, some fine sand, moist, loose	5, SS						

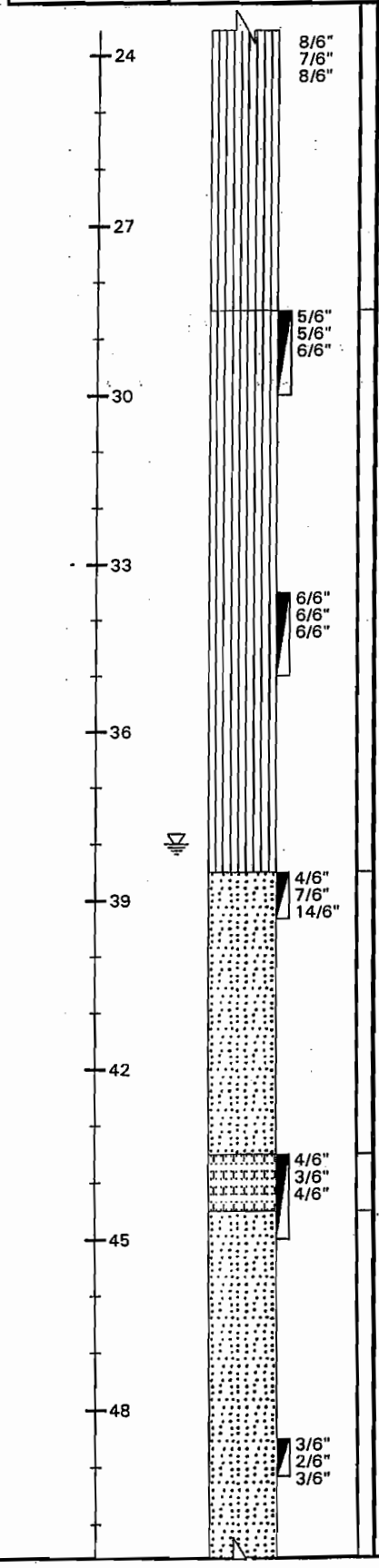
Notes:

Figure Number 3

LOG OF TEST BORING

BORING B-3

PROJECT: Turkey Creek Pumping Station **DATE:** 4/11/2005

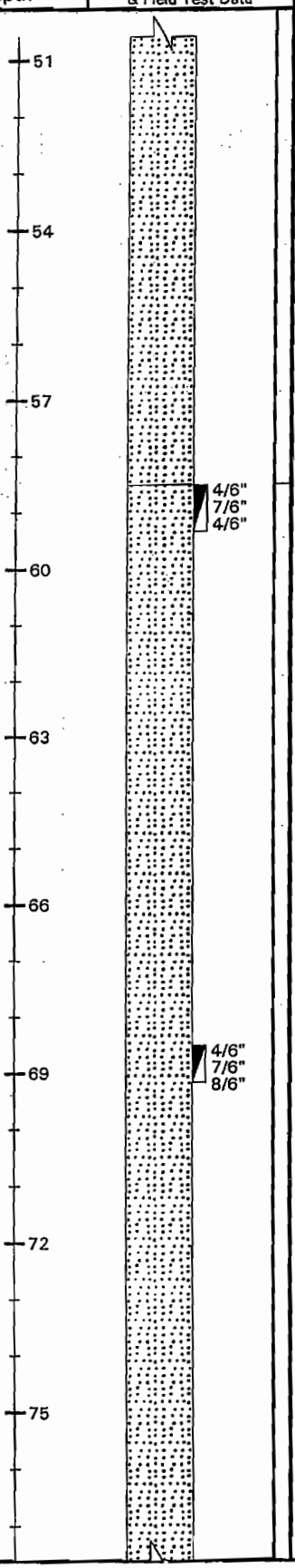


Elevation/ Depth	Soil Symbols Sampler Symbols & Field Test Data	USCS	Description	Sample # & Type	Moist-ure, %	Density pcf	LL	PI	Qu, psf	Qp, tsf
		ML	Becoming medium dense	6, SS						
			Sandy silt, moist, medium dense	7, SS						
		ML	Becoming very moist	8, SS						
			Poorly graded fine sand, trace clay, wet, medium dense	9, SS						
		SP								
		SW-SM	Well graded sand with silt, a little gravel, wet, loose	10, SS						
			Poorly graded medium to coarse sand, wet, loose							
			With trace clay	11, SS						

LOG OF TEST BORING

BORING B-3

PROJECT: Turkey Creek Pumping Station **DATE:** 4/11/2005



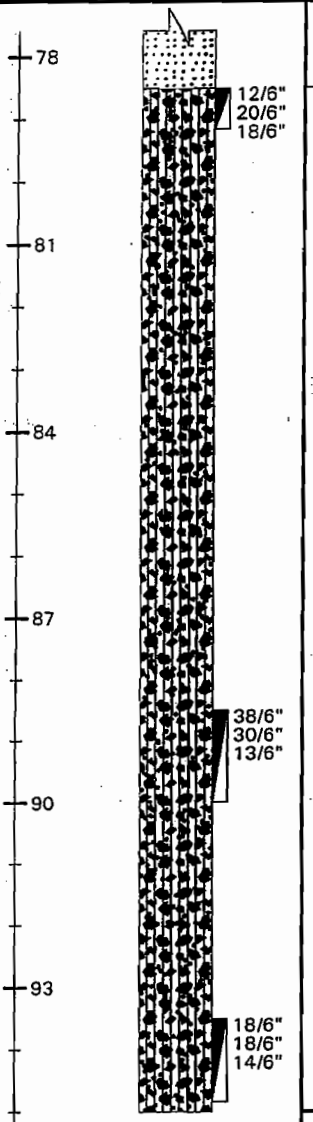
Elevation/ Depth	Soil Symbols Sampler Symbols & Field Test Data	USCS	Description	Sample # & Type	Moist-ure, %	Density pcf	LL	PI	Qu, psf	Qp, tsf
		SP								
			Poorly graded fine to medium sand, wet, medium dense	12, SS						
		SP		13, SS						

LOG OF TEST BORING

BORING B-3

PROJECT: Turkey Creek Pumping Station

DATE: 4/11/2005



Elevation/ Depth	Soil Symbols Sampler Symbols & Field Test Data	USCS	Description	Sample # & Type	Moist-ure, %	Density pcf	LL	PI	Qu, psf	Qp, tsf
			Well graded gravel with silt and sand, trace cobbles, wet, dense	14, SS						
		GW-GM		15, SS						
				16, SS						
			Drilling discontinued at 95.0'							

KEY TO SYMBOLS

Symbol	Description
strata symbols	
	Concrete
	Fill
	Silt
	Clayey sand
	Silty sand
	Poorly graded sand with silt
	Poorly graded sand
	High plasticity clay
	Well graded sand with silt
	Boulders
	Well graded gravel with silt

Symbol	Description
Soil Samplers	
	Split Spoon 1 3/8" I.D., 2" O.D.

Misc. Symbols

	Boring continues
	Water table at boring completion

Notes:

1. Exploratory borings were drilled on September 20 and 21, 2004, using 3 1/4" I.D. hollow stem augers and wash bore techniques.

2. Ground surface elevations are shown on the boring logs. Boring locations are shown on an attached Boring Location Plan.

3. Approximate groundwater levels are shown on the boring logs.

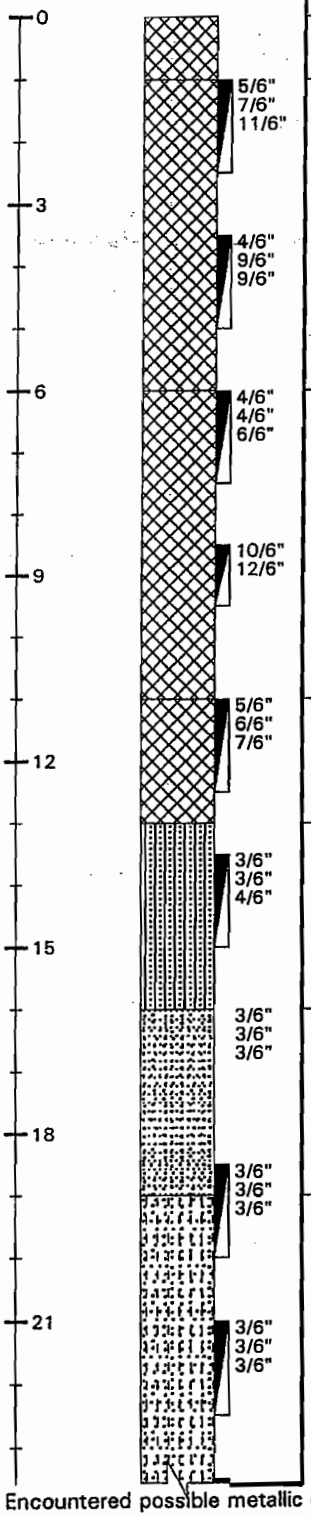
4. These logs are subject to the limitations, conclusions, and recommendations in this report.

LOG OF TEST BORING

BORING B-4

PROJECT: Turkey Creek Pumping Station
CLIENT: Camp, Dresser & McKee
PROJECT NO.: 305029G **START DATE:** 2/24/05
BORING LOCATION: See Boring Location Plan
METHOD OF DRILLING: 3 1/4" I.D. Hollow stem auger/Wash bore
INITIAL WATER: 33' **DELAYED WATER TABLE:**

DATE: 4/14/2005
ELEVATION:
FINISH DATE: 2/24/05
LOGGER: TRS
CAVING:
DATE CHECKED:



Elevation/ Depth	Soil Symbols Sampler Symbols & Field Test Data	USCS	Description	Sample # & Type	Moisture, %	Density pcf	LL	PI	Qu, psf	Qp, tsf
		Fill	Fill, lean clay, dark brown, trace organics, very moist, soft							
			Fill, silty fine sand, light brown, trace rock fragments, moist, medium dense	1, SS	17.1					
		Fill		2, SS						
			Fill, sandy silt, grayish brown, trace rock fragments, moist, medium dense	3, SS						
		Fill		4, SS	16.5					
		Fill	Fill, silty fine sand, brownish gray, trace clay and concrete fragments, moist, medium dense	5, SS						
		SM	Silty fine sand, grayish brown, trace gravel, moist, loose	6, SS						
		SW-SP	Poorly to well graded sand, trace gravel, moist, loose	7, SS						
				8, SS						
			Poorly graded fine sand with silt, light brown, slightly moist, loose							
				9, SS						

Notes: Encountered possible metallic object at 9.5'. Offset boring 4' north to avoid.

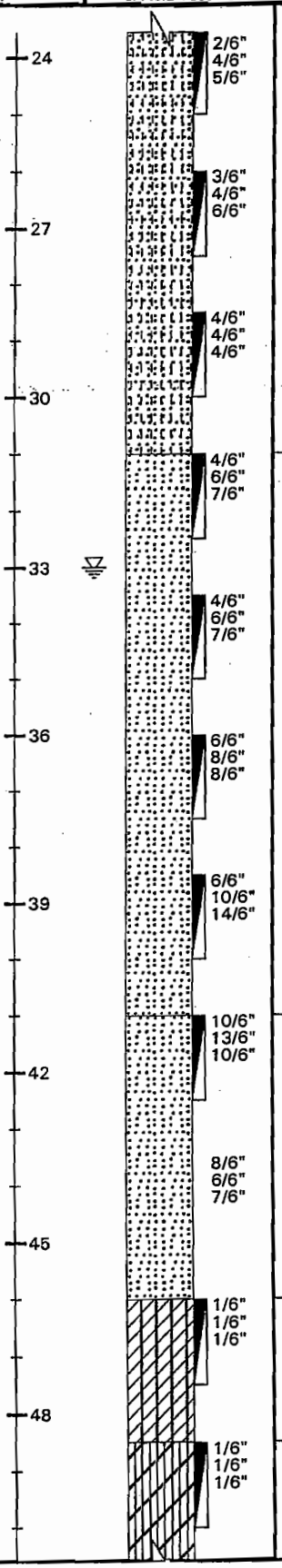
Figure Number 1

LOG OF TEST BORING

BORING B-4

PROJECT: Turkey Creek Pumping Station

DATE: 4/14/2005

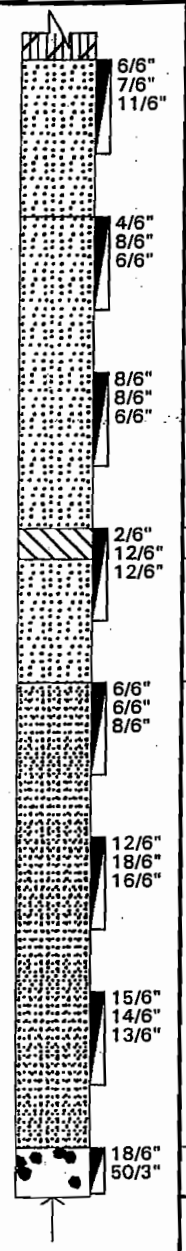


USCS	Description	Sample # & Type	Moisture, %	Density pcf	LL	PI	Qu, psf	Qp, tsf
SP-SM		10, SS						
	Becoming medium dense	11, SS						
	Becoming loose	12, SS						
	Poorly graded fine sand, grayish brown, moist, medium dense	13, SS						
	Becoming light brown	14, SS						
SP		15, SS						
	With trace clay	16, SS						
	Poorly graded fine sand, light brown, trace gravel, medium dense	17, SS						
SP		18, SS						
CL	Lean clay, gray, with silt, moist, soft	19, SS						
CL-ML	Silty clay, gray, wet, soft	20, SS	25.1					

LOG OF TEST BORING

BORING B-4

PROJECT: Turkey Creek Pumping Station **DATE:** 4/14/2005



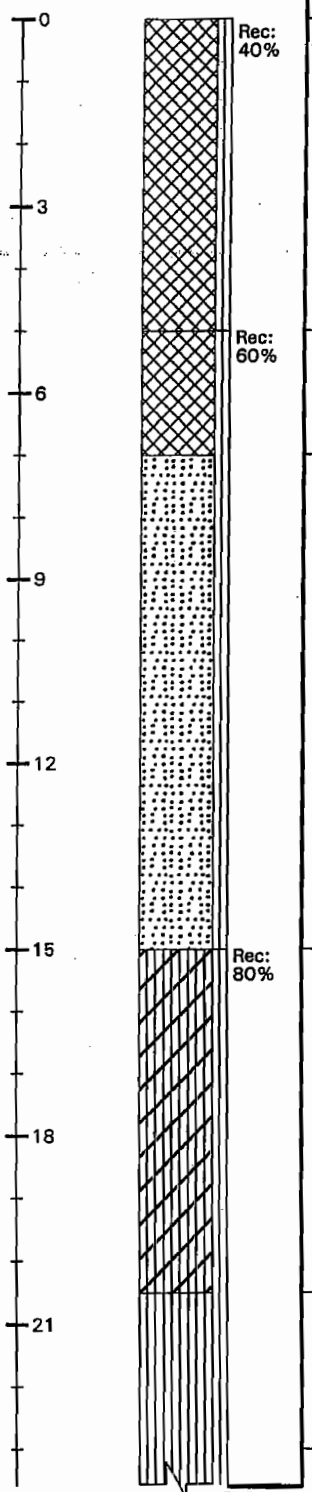
Elevation/ Depth	USCS	Description	Sample # & Type	Moist-ure, %	Density pcf	LL	PI	Qu, psf	Qp, tsf
51	SP	Poorly graded fine sand, gray, medium dense	21, SS						
54	SP	Poorly graded fine to medium sand, trace clay, medium dense	22, SS						
57	SP	With trace gravel	23, SS						
	CH	Fat clay, gray, moist, soft	24, SS						
60	SP	Poorly graded fine to medium sand, gray, medium dense							
63	SW-SP	Poorly to well graded sand, gray, trace gravel, medium dense	25, SS						
			26, SS						
66			27, SS						
69	Cbl	Cobbles and boulders	28, SS						
		Auger refusal on probable boulder at 69.3'							
72									
75									

LOG OF TEST BORING

BORING B-5

PROJECT: Turkey Creek Pumping Station
CLIENT: Camp, Dresser & McKee
PROJECT NO.: 305029G **START DATE:** 4/08/05
BORING LOCATION: See Boring Location Plan
METHOD OF DRILLING: Sonic
INITIAL WATER: **DELAYED WATER TABLE:**

DATE: 4/14/2005
ELEVATION:
FINISH DATE: 4/08/05
LOGGER: LEW
CAVING:
DATE CHECKED:



Elevation/ Depth	Soil Symbols Sampler Symbols & Field Test Data	USCS	Description	Sample # & Type	Moist-ure, %	Density pcf	LL	PI	Qu, psf	Qp, tsf
0	Rec: 40%	Fill	Fill, brown lean clay, stiff, slightly moist	1, NQ						
6	Rec: 60%	Fill	Fill, light brown silty lean clay, wet, soft	2, NQ						
9		SP	Poorly graded fine sand with little silt							
15	Rec: 80%	CL-ML	Silty lean to fat clay, dark brown, moist to wet, medium to stiff	3, NQ						
21			Sandy silt, brown, moist							

Notes: Obtained continuous 3.5" diameter samples. Sample length and recovery % noted in description column. Installed piezometer-screened interval 35'-80'.

Figure Number 2

LOG OF TEST BORING

BORING B-5

PROJECT: Turkey Creek Pumping Station

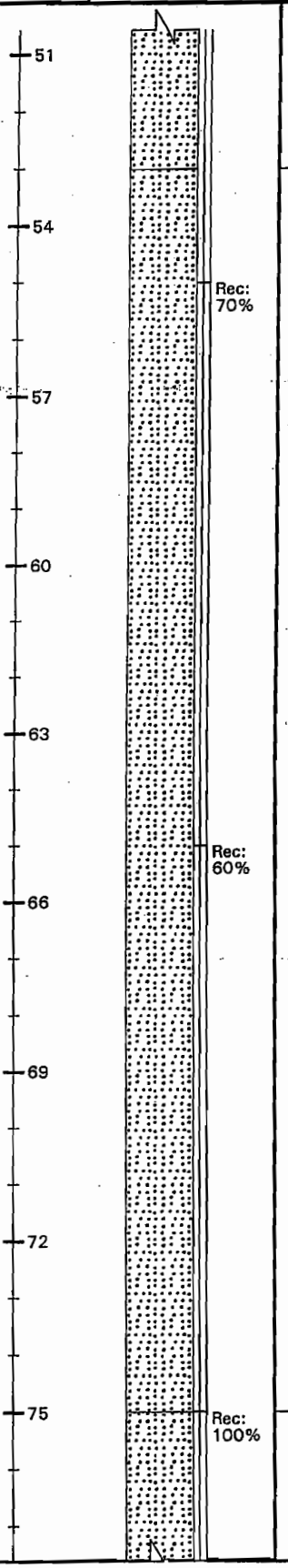
DATE: 4/14/2005

Elevation/ Depth	Soil Symbols Sampler Symbols & Field Test Data	USCS	Description	Sample # & Type	Moist-ure, %	Density pcf	LL	PI	Qu, psf	Qp, tsf
24	Rec: 30%			4, NQ						
27		ML								
30										
33										
36	Rec: 90%	CL/ CH	Sandy clay, brown	5, NQ						
		SC	Clayey sand, brown							
39			Poorly graded fine sand, gray							
		SP	Becoming medium							
42										
		CL/ CH	Lean to fat clay, brown, wet, medium to soft with sand seams							
45	Rec: 100%	SP	Poorly graded medium to coarse sand	6, NQ						
		CL/ CH	Sandy clay							
48			Poorly graded silty fine sand, brown							
		SP								

LOG OF TEST BORING

BORING B-5

PROJECT: Turkey Creek Pumping Station **DATE:** 4/14/2005



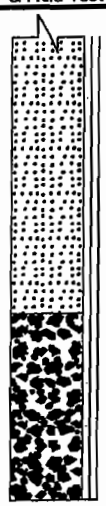
Elevation/ Depth	Soil Symbols Sampler Symbols & Field Test Data	USCS	Description	Sample # & Type	Moist-ure, %	Density pcf	LL	PI	Qu, psf	Qp, tsf
			Poorly graded fine to medium sand							
				7, NQ						
		SP								
				8, NQ						
			Poorly graded sand with gravel, silt, trace cobbles	9, NQ						

LOG OF TEST BORING

BORING B-5

PROJECT: Turkey Creek Pumping Station

DATE: 4/14/2005



Elevation/ Depth	Soil Symbols Sampler Symbols & Field Test Data	USCS	Description	Sample # & Type	Moist-ure, %	Density pcf	LL	PI	Qu, psf	Qp, tsf
78		SP								
81										
		GW-GP	Poorly to well graded gravel, with sand, silt, limestone cobbles							
84										
			Drilling discontinued at 85.0'							
87										
90										
93										
96										
99										
102										

KEY TO SYMBOLS

Symbol	Description
strata symbols	
	Fill
	Silty sand
	Interlayered well/poorly graded sand
	Poorly graded sand with silt
	Poorly graded sand
	Low plasticity clay
	Silty low plasticity clay
	High plasticity clay
	Cobbles
	Low-high plasticity clays
	Clayey sand
	Silt
	Well graded gravel/ clayey gravel

Symbol	Description
Misc. Symbols	
	Boring continues
	Water table at boring completion
	Drill rejection
Soil Samplers	
	Split Spoon 1 3/8" I.D., 2" O.D.
	Rotosonic Continuous Sample 3 ½" I.D., 6" O.D.

Notes:

1. Exploratory borings were drilled on February 24 and April 8, 2005, using 3 1/4" I.D. hollow stem augers, wash bore techniques, and sonic methods.

2. Ground surface elevations are shown on the boring logs. Boring locations are shown on an attached Boring Location Plan.

3. Approximate groundwater levels are shown on the boring logs.

4. These logs are subject to the limitations, conclusions, and recommendations in this report.

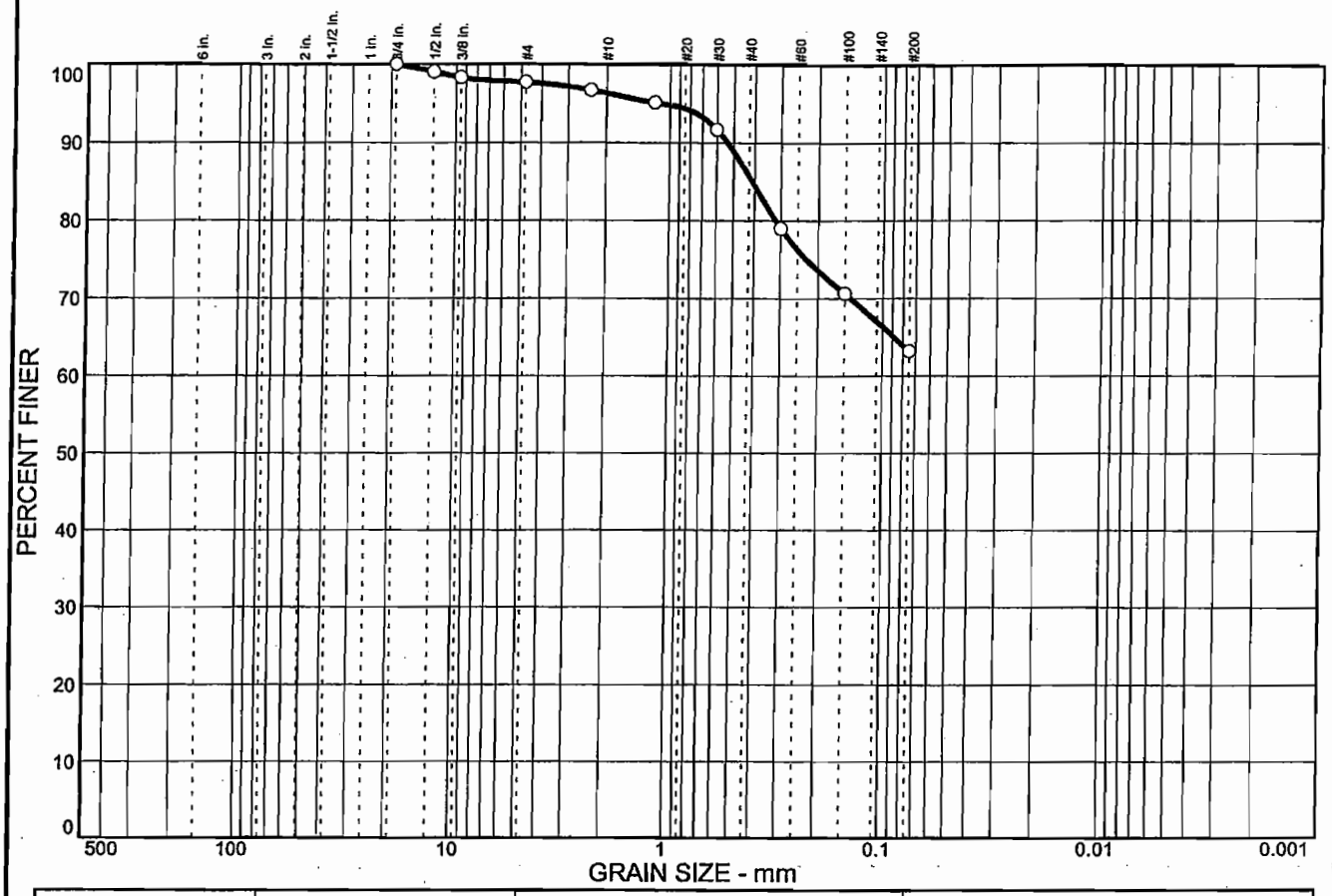
LABORATORY TEST RESULTS B1 THRU B3

SUMMARY OF LABORATORY RESULTS

Boring	Depth (Ft)	Sample No./Type	Natural Moisture %	Natural Dry Density (pcf)	Unconfined Compressive Strength (psf)	Atterberg Limits		Swell/Consolidation		Soil Type
						Liquid Limit %	Plasticity Index %	Swell Pressure (psf)	Volume Change %	
1	1.0-2.5	1, SS								
1	3.5-5.0	2, SS								
1	8.5-10.0	3, SS								ML
1	13.5-15.0	4, SS								ML
1	18.5-20.0	5, SS								ML
2	1.0-2.5	1, SS								
2	3.5-5.0	2, SS								
2	8.5-10.0	3, SS								
2	13.5-15.0	4, SS								ML
2	18.5-20.0	5, SS								
2	23.5-25.0	6, SS								ML
2	28.5-30.0	7, SS								ML
2	33.5-35.0	8, SS								
2	38.5-40.0	9, SS								SM
2	43.5-45.0	10, SS								SP-SM
2	48.5-50.0	11, SS								
2	58.5-60.0	12, SS				76	53			CH
2	68.5-70.0	13, SS								SW-SM
2	73.5-73.7	14, SS								
3	1.0-2.5	1, SS								
3	3.5-5.0	2, SS								
3	8.5-10.0	3, SS								
3	13.5-15.0	4, SS								
3	18.5-20.0	5, SS								ML
3	23.5-25.0	6, SS								
3	28.5-30.0	7, SS								ML

Boring	Depth (Ft)	Sample No./Type	Natural Moisture %	Natural Dry Density (pcf)	Unconfined Compressive Strength (psf)	Atterberg Limits		Swell/Consolidation		Soil Type
						Liquid Limit %	Plasticity Index %	Swell Pressure (psf)	Volume Change %	
3	33.5-35.0	8, SS								ML
3	38.5-40.0	9, SS								
3	43.5-45.0	10, SS								SP
3	48.5-50.0	11, SS								
3	58.5-60.0	12, SS								SP
3	68.5-70.0	13, SS								
3	78.5-80.0	14, SS								GW-GM
3	88.5-90.0	15, SS								
3	93.5-95.0	16, SS								GW-GM

Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	2.3	1.4	10.5	22.6	63.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
1/2 in.	99.0		
3/8 in.	98.3		
#4	97.7		
#8	96.7		
#16	95.1		
#30	91.7		
#50	79.0		
#100	70.6		
#200	63.2		

* (no specification provided)

Soil Description

Sandy silt

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.409 D_{60}= D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= ML AASHTO=

Remarks

Specific gravity of 2.65 assumed

Sample No.: **Source of Sample:** **Date:** 10/06/04

Location: B-1 S-3 @ 8.5-10.0' **Elev./Depth:**

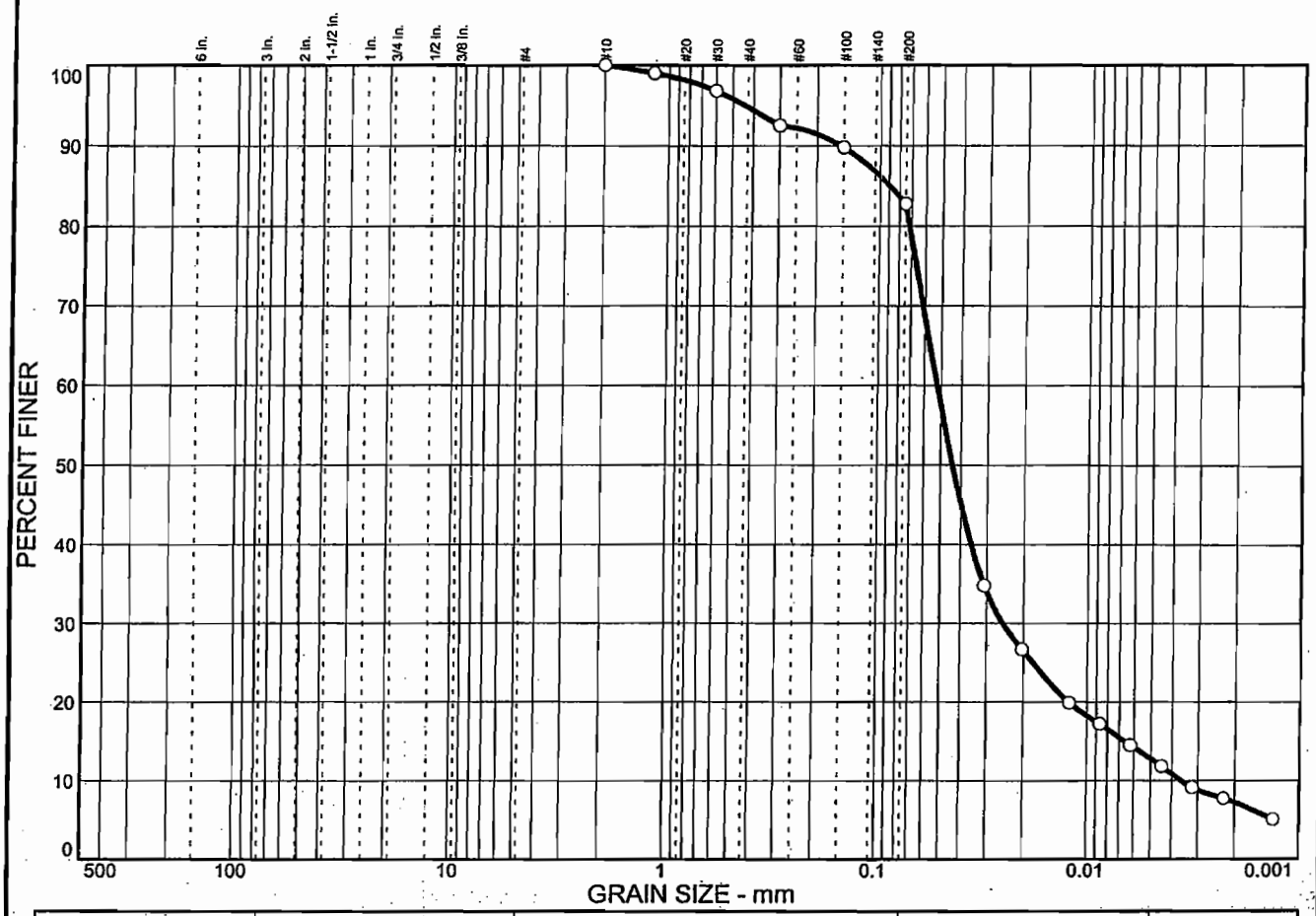
KTI

Client: C.D.M.

Project: Turkey Creek Pump Station

Project No: 304160G **Page**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	17.2	70.0	12.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#16	99.0		
#30	96.8		
#50	92.5		
#100	89.8		
#200	82.8		

* (no specification provided)

Soil Description

Silt with sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.0896 D_{60}= 0.0522 D_{50}= 0.0438
D_{30}= 0.0252 D_{15}= 0.0066 D_{10}= 0.0036
C_u= 14.48 C_c= 3.37

Classification

USCS= ML AASHTO=

Remarks

Specific gravity of 2.65 assumed

Sample No.: **Source of Sample:** **Date:** 10/06/04
Location: B-1 S-4 @ 13.5-15.0' **Elev./Depth:**

KTI

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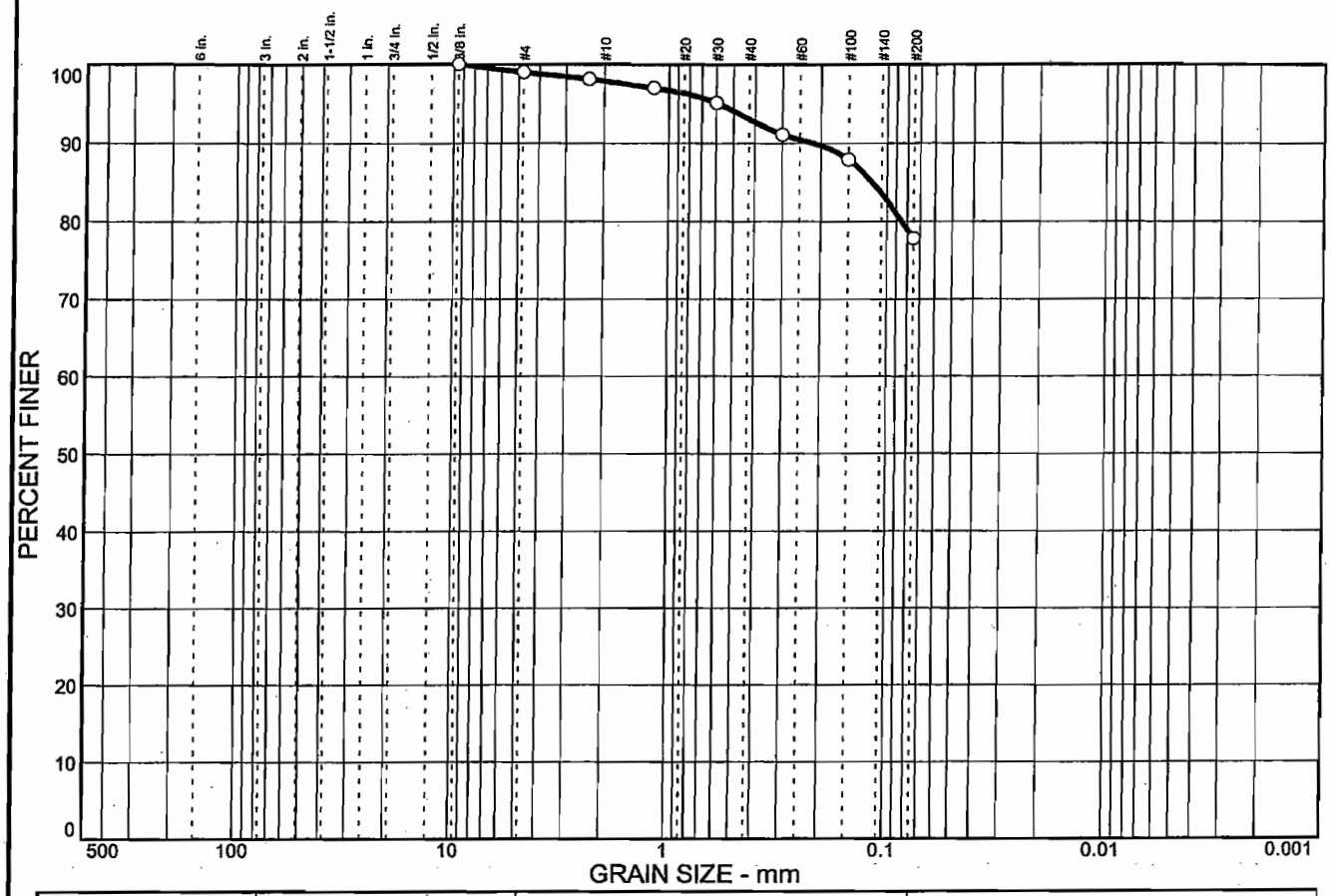
Project: Turkey Creek Pump Station
Project No: 304160G **Page**

Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	1.0	1.1	4.8	15.3	77.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8 in.	100.0		
#4	99.0		
#8	98.1		
#16	97.0		
#30	95.1		
#50	91.1		
#100	87.9		
#200	77.8		

* (no specification provided)

Soil Description

Silt with sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.117 D_{60}= D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= ML AASHTO=

Remarks

Specific gravity of 2.65 assumed

Sample No.: **Source of Sample:** **Date:** 10/06/04
Location: B-1 S-5 @ 18.5-20.0' **Elev./Depth:**

KTI

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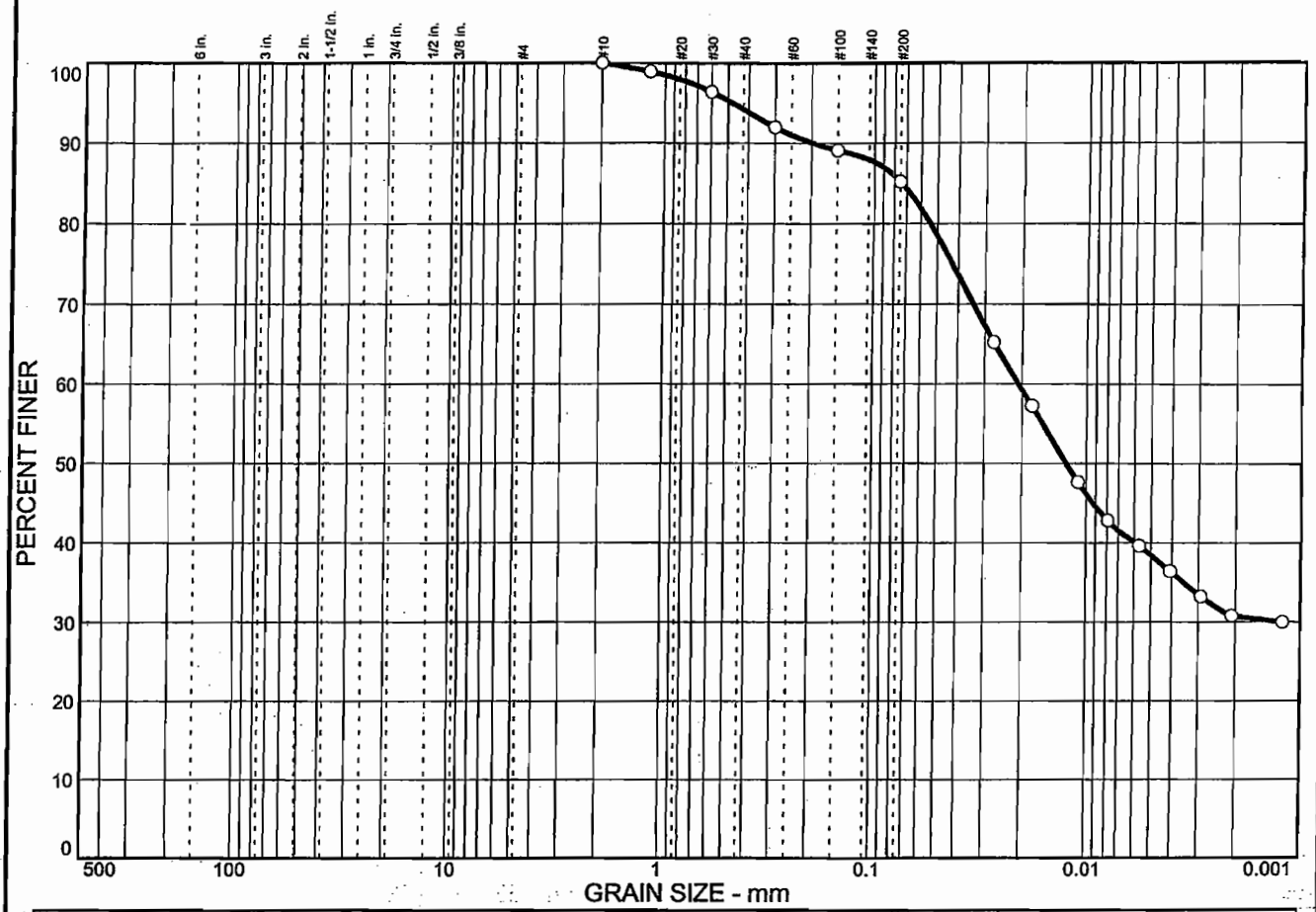
Project: Turkey Creek Pump Station
Project No: 304160G **Page**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	14.8	46.8	38.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#16	98.9		
#30	96.4		
#50	92.0		
#100	89.1		
#200	85.2		

* (no specification provided)

Soil Description

Silt

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.0738 D_{60}= 0.0209 D_{50}= 0.0125
D_{30}= 0.0012 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= ML AASHTO=

Remarks

Specific gravity of 2.65 assumed

Sample No.: **Source of Sample:** **Date:** 10/06/04

Location: B-2 S-4 @ 13.5-15.0' **Elev./Depth:**

KTI

Client: C.D.M.

Project: Turkey Creek Pump Station

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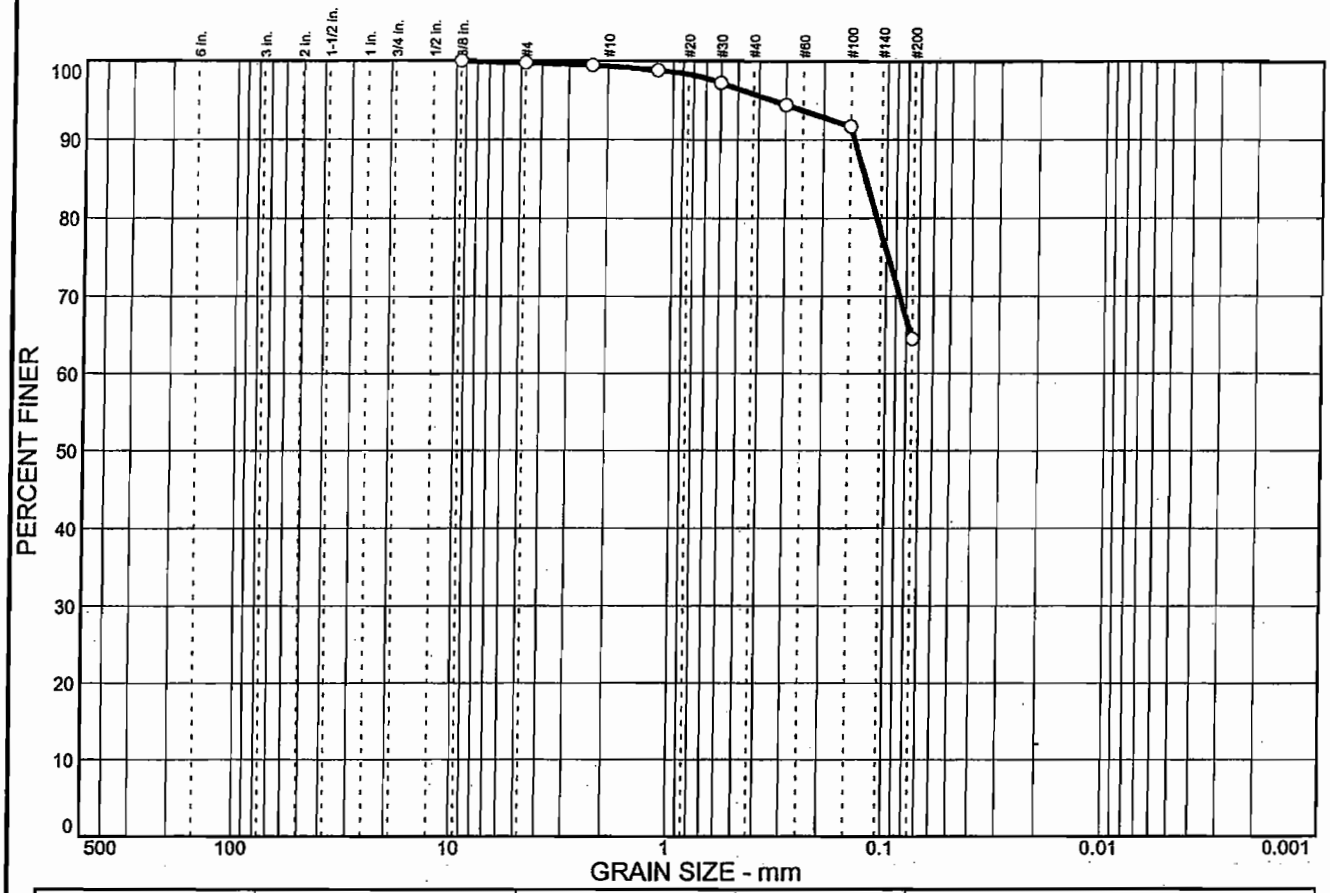
Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.3	0.4	3.5	31.3	64.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8 in.	100.0		
#4	99.7		
#8	99.4		
#16	98.8		
#30	97.2		
#50	94.4		
#100	91.7		
#200	64.5		

* (no specification provided)

Soil Description

Sandy silt

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.126 D_{60}= D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= ML AASHTO=

Remarks

Specific gravity of 2.65 assumed

Sample No.: **Source of Sample:** **Date:** 10/06/04

Location: B-2 S-6 @ 23.5-25.0' **Elev./Depth:**

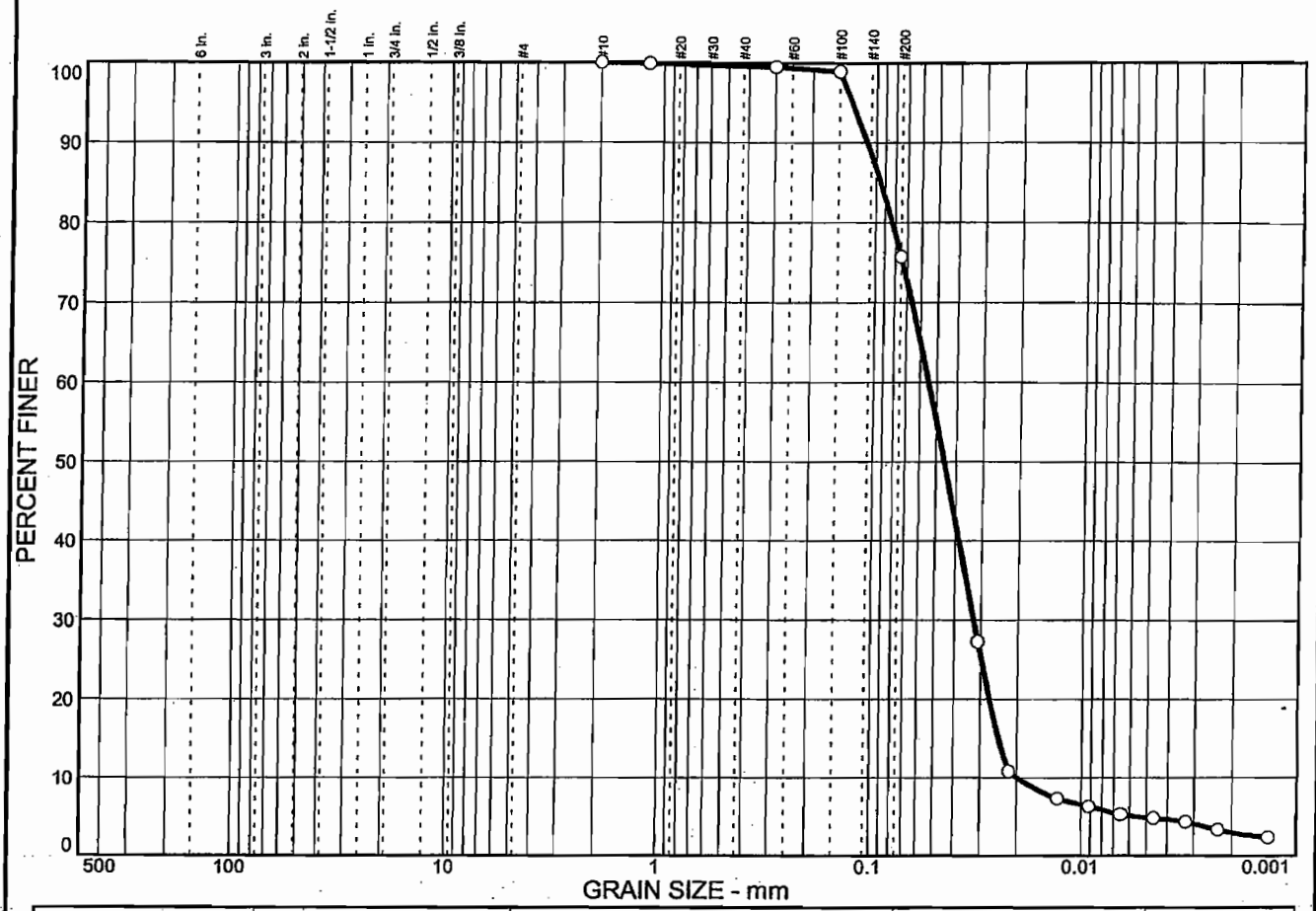
KTI

Client: C.D.M.

Project: Turkey Creek Pump Station

Project No: 304160G **Page**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	24.3	70.8	4.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#16	99.9		
#50	99.5		
#100	98.9		
#200	75.7		

* (no specification provided)

Soil Description

Sandy silt

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.0952 D_{60}= 0.0546 D_{50}= 0.0457
D_{30}= 0.0325 D_{15}= 0.0245 D_{10}= 0.0199
C_u= 2.74 C_c= 0.97

Classification

USCS= ML AASHTO=

Remarks

Specific gravity of 2.65 assumed

Hydrometer performed after sieve analysis

Sample No.: **Source of Sample:** **Date:** 10/06/04

Location: B-2 S-6 @ 23.5-25.0' **Elev./Depth:**

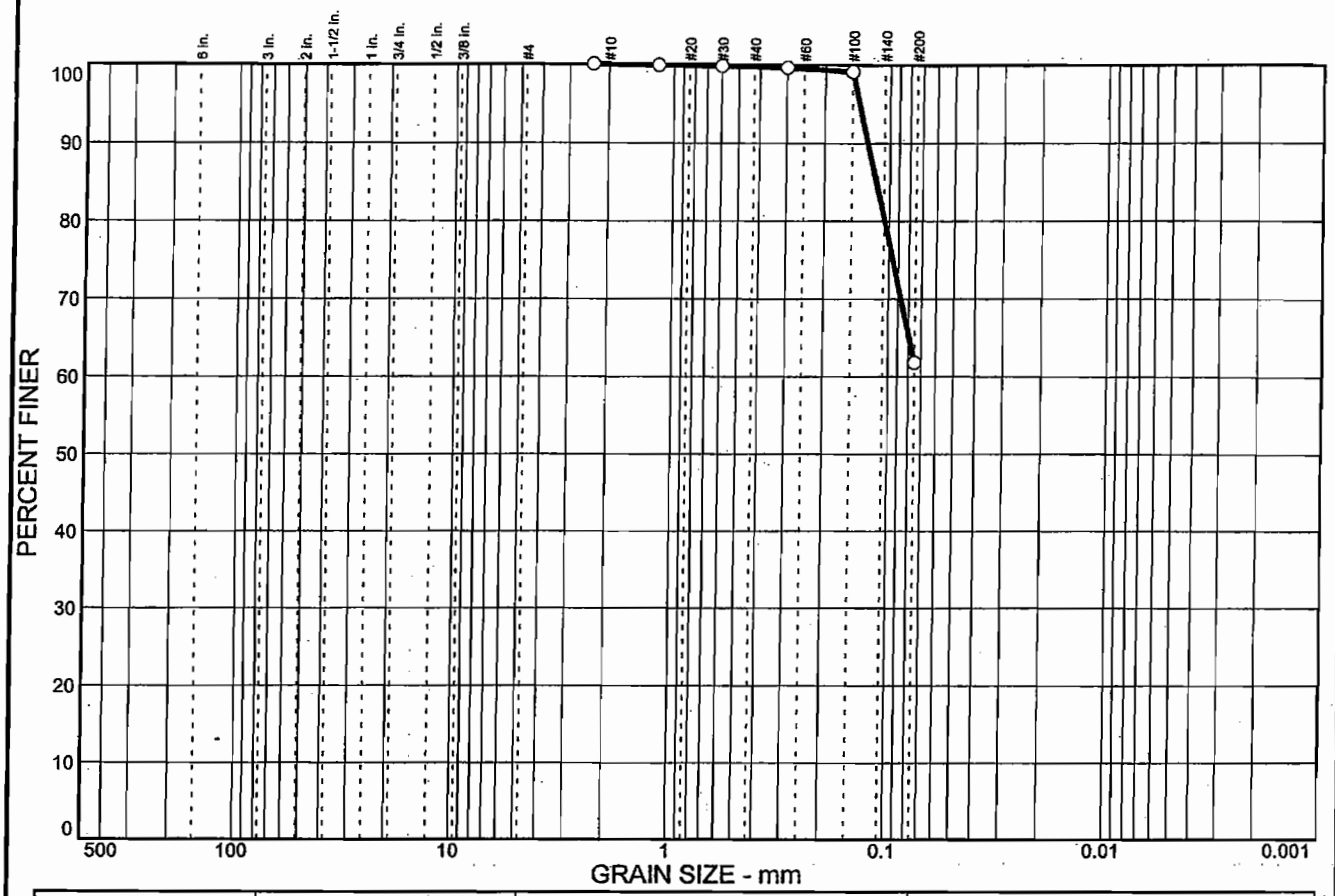
KTI

Client: C.D.M.

Project: Turkey Creek Pump Station

Project No: 304160G **Page**

Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.0	0.2	38.0	61.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#8	100.0		
#16	99.9		
#30	99.8		
#50	99.6		
#100	99.1		
#200	61.8		

* (no specification provided)

Soil Description

Sandy silt

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.115 D_{60}= D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= ML AASHTO=

Remarks

Specific gravity of 2.65 assumed

Sample No.: **Source of Sample:** **Date:** 10/06/04

Location: B-2 S-7 @ 28.5-30.0' **Elev./Depth:**

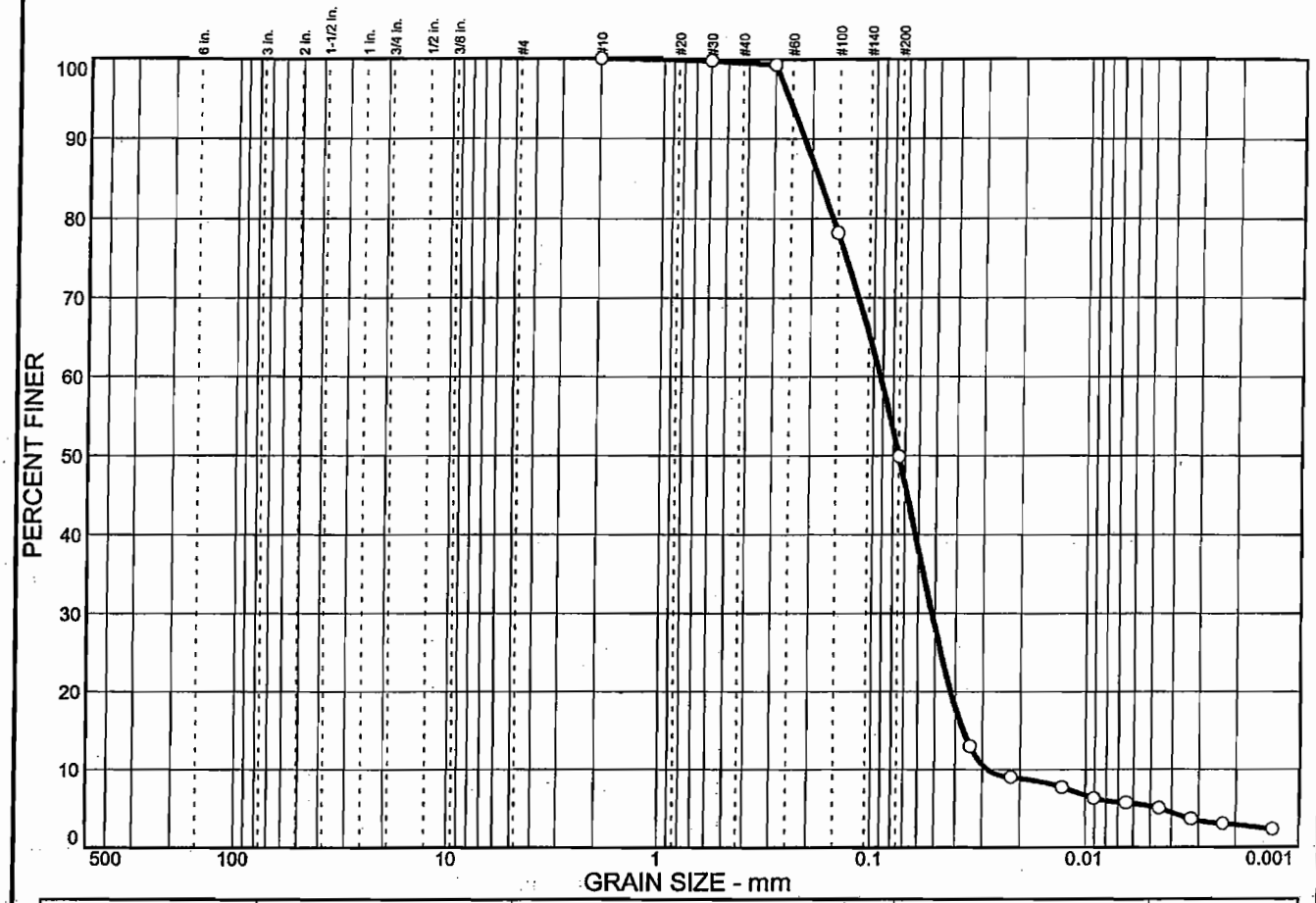
KTI

Client: C.D.M.

Project: Turkey Creek Pump Station

Project No: 304160G **Page**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	50.1	44.6	5.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#30	99.8		
#50	99.3		
#100	78.2		
#200	49.9		

* (no specification provided)

Soil Description

Silty sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.185 D_{60}= 0.0929 D_{50}= 0.0751
D_{30}= 0.0518 D_{15}= 0.0368 D_{10}= 0.0284
C_u= 3.27 C_c= 1.02

Classification

USCS= SM AASHTO=

Remarks

Specific gravity of 2.65 assumed

Sample No.: **Source of Sample:** **Date:** 10/06/04

Location: B-2 S-8 @ 33.5-35.0' **Elev./Depth:**

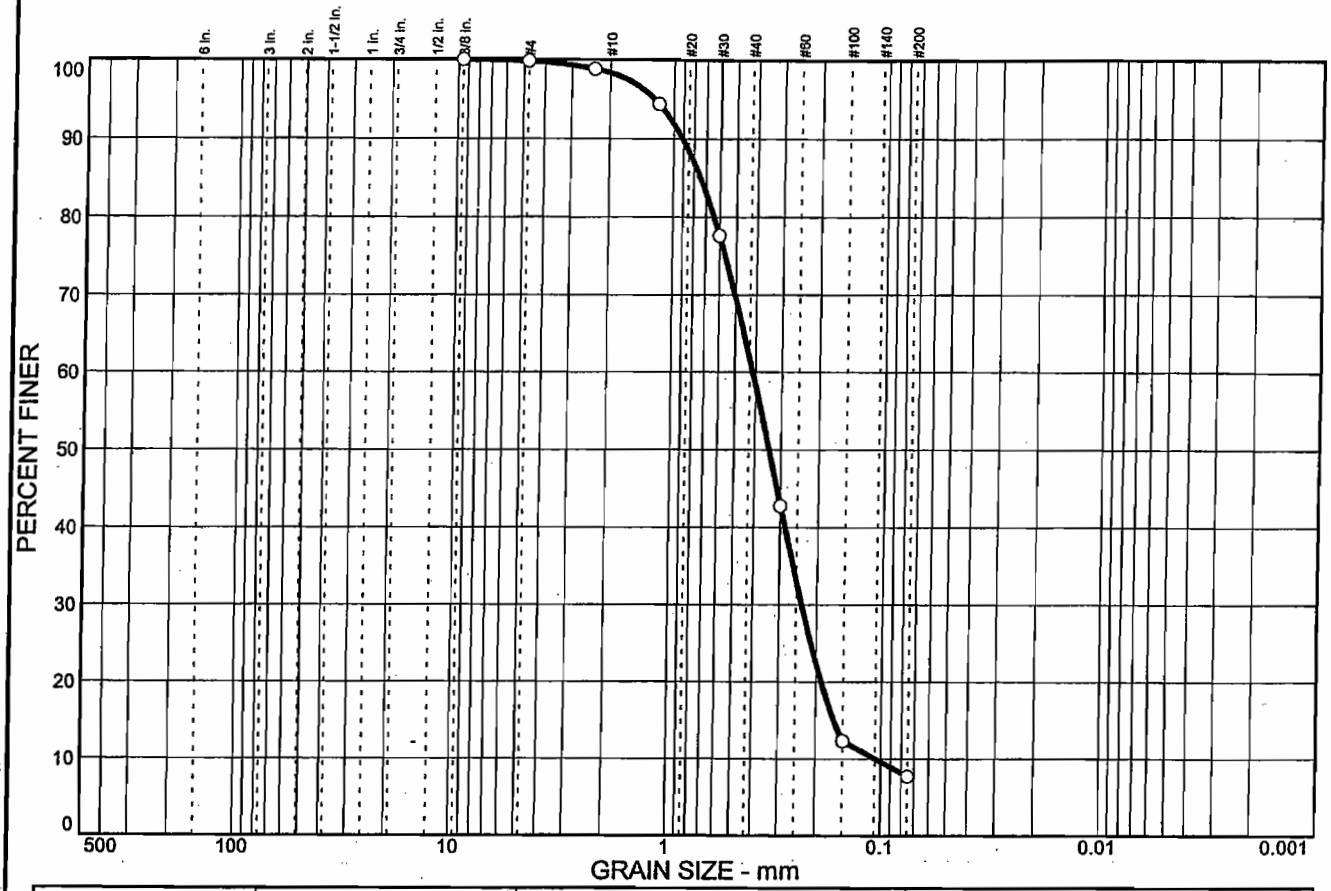
KTI

Client: C.D.M.

Project: Turkey Creek Pump Station

Project No: 304160G **Page**

Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.2	1.5	36.7	53.9	7.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8 in.	100.0		
#4	99.8		
#8	98.8		
#16	94.4		
#30	77.6		
#50	42.8		
#100	12.3		
#200	7.7		

* (no specification provided)

Soil Description

Poorly graded sand with silt

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.746 D_{60}= 0.412 D_{50}= 0.342
D_{30}= 0.235 D_{15}= 0.165 D_{10}= 0.106
C_u= 3.88 C_c= 1.27

Classification

USCS= SP-SM AASHTO=

Remarks

Specific gravity of 2.65 assumed

Sample No.: **Source of Sample:** **Date:** 10/06/04

Location: B-2 S-9 @ 38.5-40.0' **Elev./Depth:**

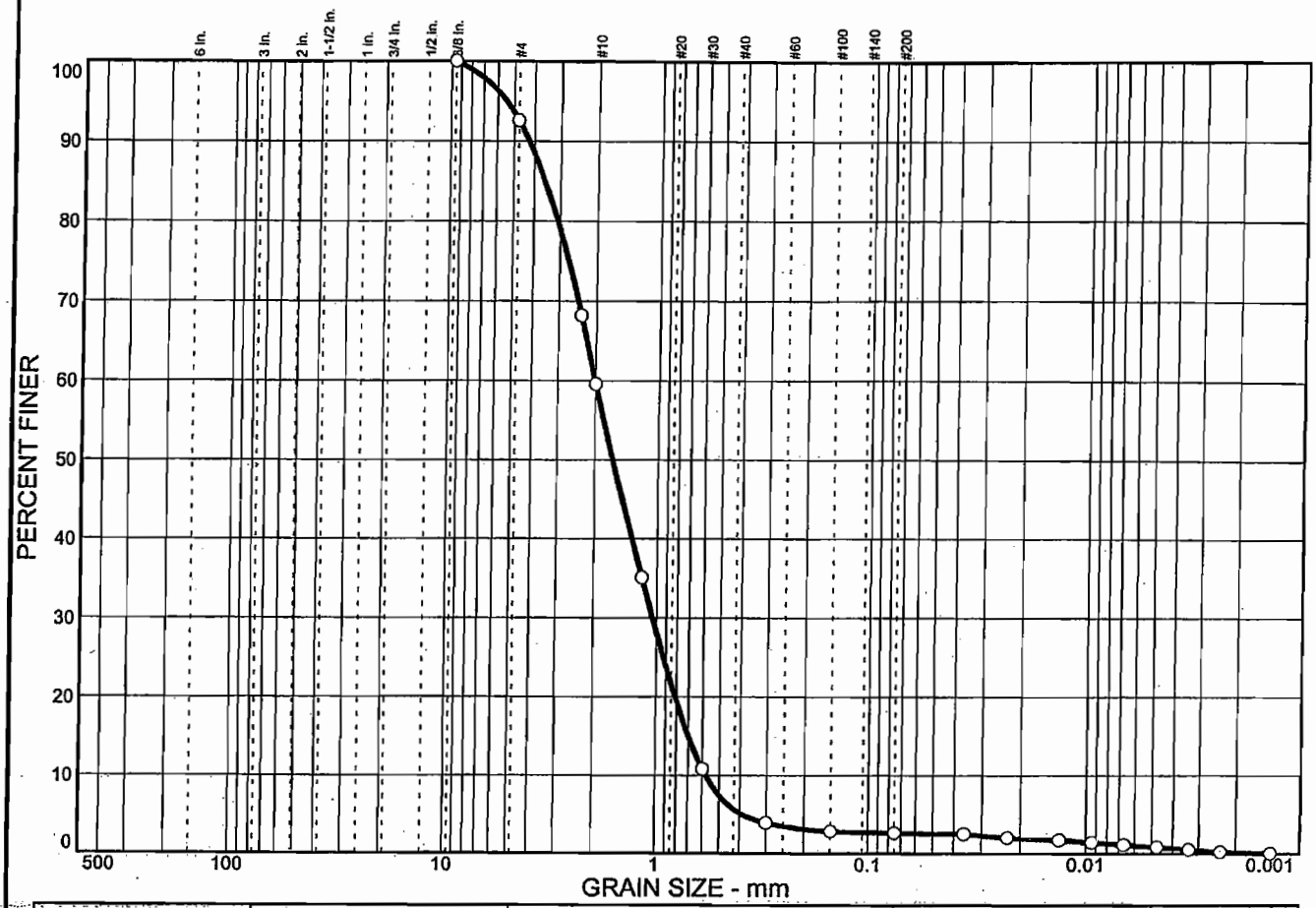
KTI

Client: C.D.M.

Project: Turkey Creek Pump Station

Project No: 304160G **Page**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	7.4	90.0	1.8	0.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8 in.	100.0		
#4	92.6		
#8	68.2		
#10	59.6		
#16	35.1		
#30	10.8		
#50	3.9		
#100	2.8		
#200	2.6		

* (no specification provided)

Soil Description

Poorly graded sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 3.55 D_{60}= 2.02 D_{50}= 1.65
D_{30}= 1.05 D_{15}= 0.701 D_{10}= 0.579
C_u= 3.48 C_c= 0.94

Classification

USCS= SP AASHTO=

Remarks

Specific gravity of 2.65 assumed

Sample No.: **Source of Sample:** **Date:** 10/06/04

Location: B-2 S-10 @ 43.5-45.0' **Elev./Depth:**

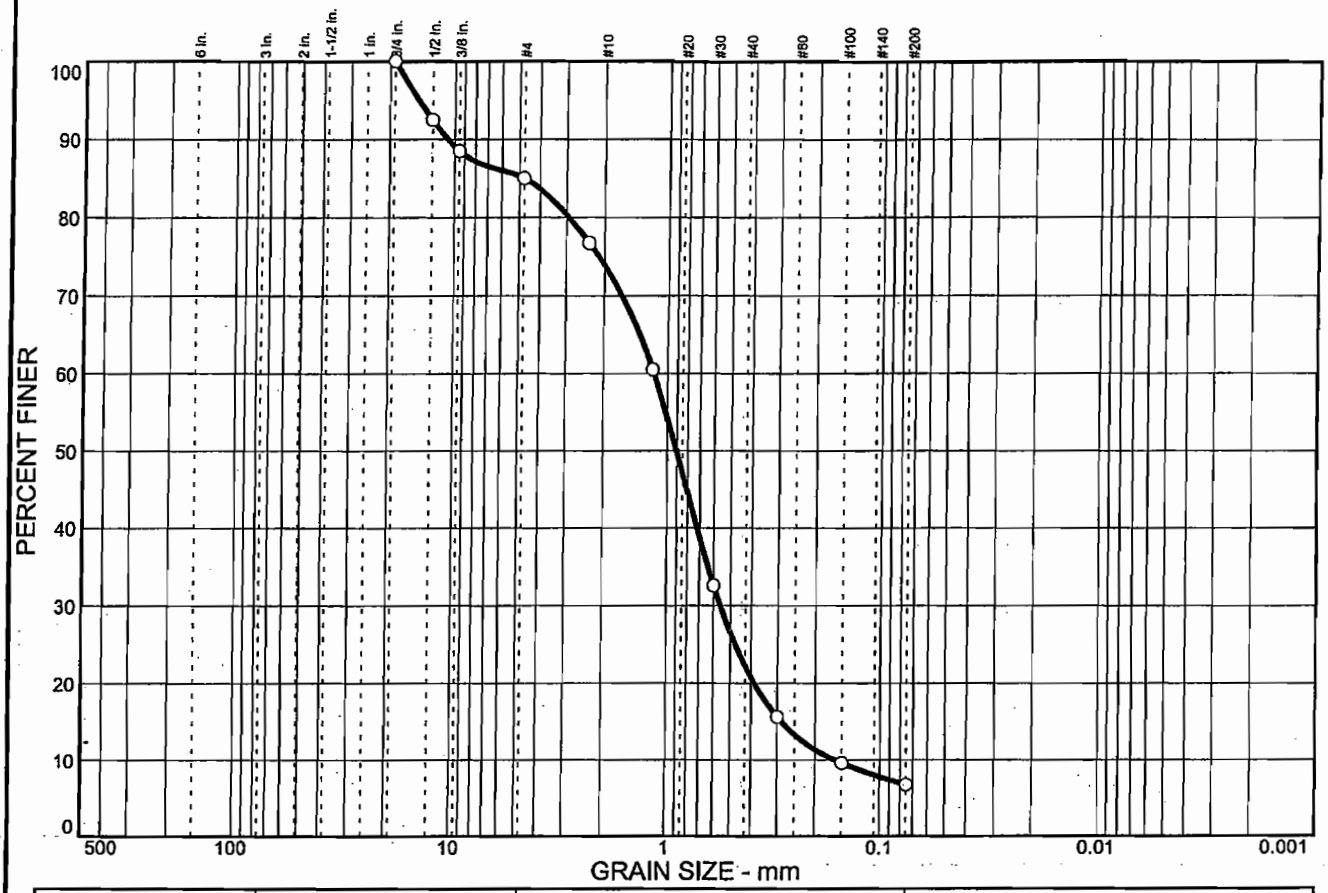
KTI

Client: C.D.M.

Project: Turkey Creek Pump Station

Project No: 304160G **Page**

Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	15.0	11.1	51.7	15.5	6.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
1/2 in.	92.5		
3/8 in.	88.5		
#4	85.0		
#8	76.7		
#16	60.5		
#30	32.6		
#50	15.6		
#100	9.6		
#200	6.7		

* (no specification provided)

Soil Description

Well-graded sand with silt and gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 4.75 D_{60}= 1.16 D_{50}= 0.908
D_{30}= 0.558 D_{15}= 0.287 D_{10}= 0.162
C_u= 7.19 C_c= 1.65

Classification

USCS= SW-SM AASHTO=

Remarks

Specific gravity of 2.65 assumed

Sample No.: **Source of Sample:** **Date:** 10/06/04

Location: B-2 S-13 @ 68.5-70.0' **Elev./Depth:**

KTI

Client: C.D.M.

Project: Turkey Creek Pump Station

Project No: 304160G **Page**

Particle Size Distribution Report

% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	8.4	59.1	32.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#16	99.0		
#30	97.0		
#50	95.7		
#100	94.5		
#200	91.6		

* (no specification provided)

Soil Description

Silt

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.0619 D_{60}= 0.0302 D_{50}= 0.0225
D_{30}= 0.0036 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= ML AASHTO=

Remarks

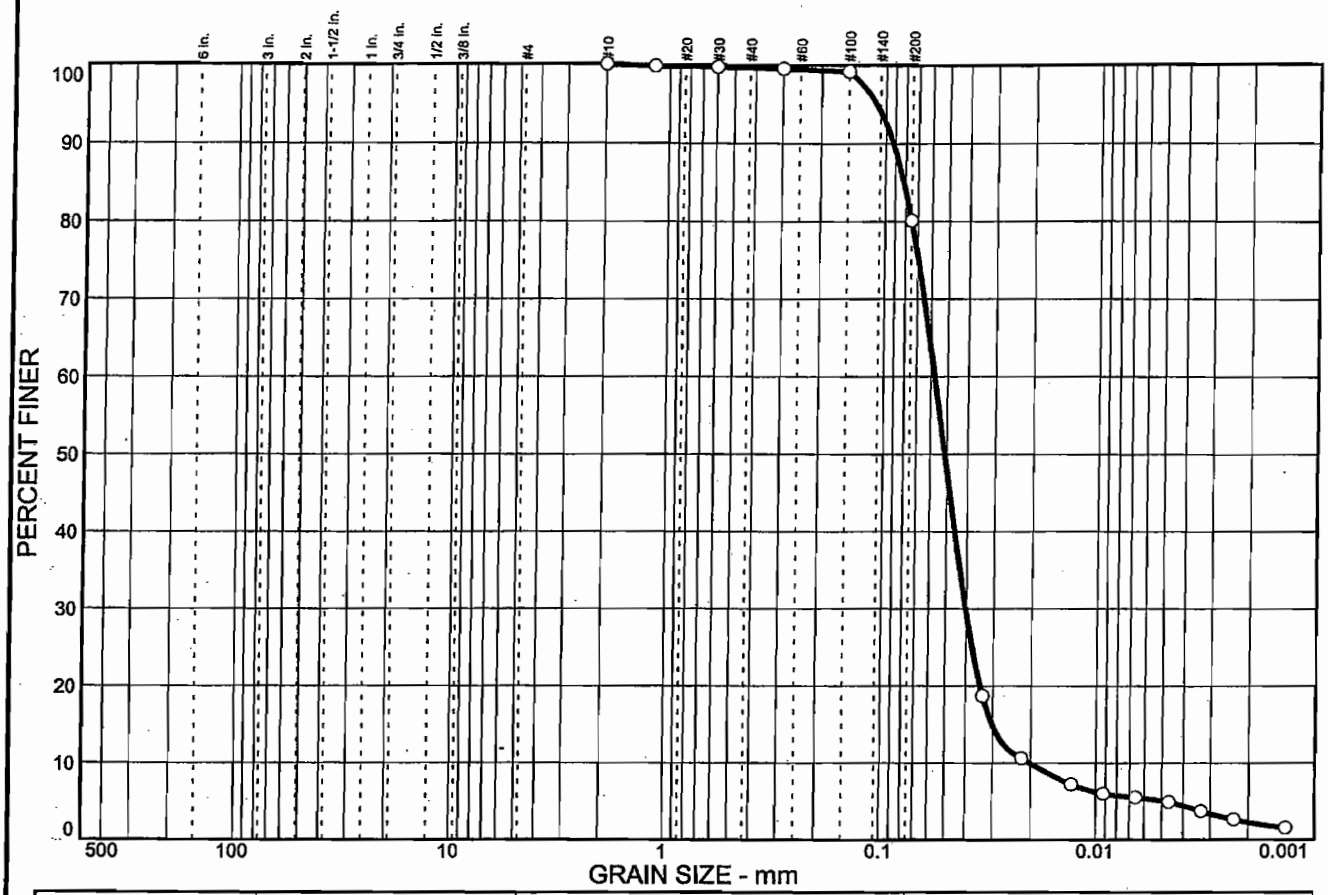
Specific gravity of 2.65 assumed

Sample No.: **Source of Sample:** **Date:** 10/06/04
Location: B-3 S-5 @ 18.5-20.0' **Elev./Depth:**

KTI

Client: C.D.M.
Project: Turkey Creek Pump Station
Project No: 304160G **Page**

Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.0	0.4	19.5	75.0	5.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#16	99.8		
#30	99.7		
#50	99.5		
#100	99.2		
#200	80.1		

* (no specification provided)

Soil Description

Silt with sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.0819 D_{60}= 0.0576 D_{50}= 0.0514
D_{30}= 0.0403 D_{15}= 0.0302 D_{10}= 0.0203
C_u= 2.85 C_c= 1.39

Classification

USCS= ML AASHTO=

Remarks

Specific gravity of 2.65 assumed

Sample No.: **Source of Sample:** **Date:** 10/06/04

Location: B-3 S-7 @ 28.5-30.0' **Elev./Depth:**

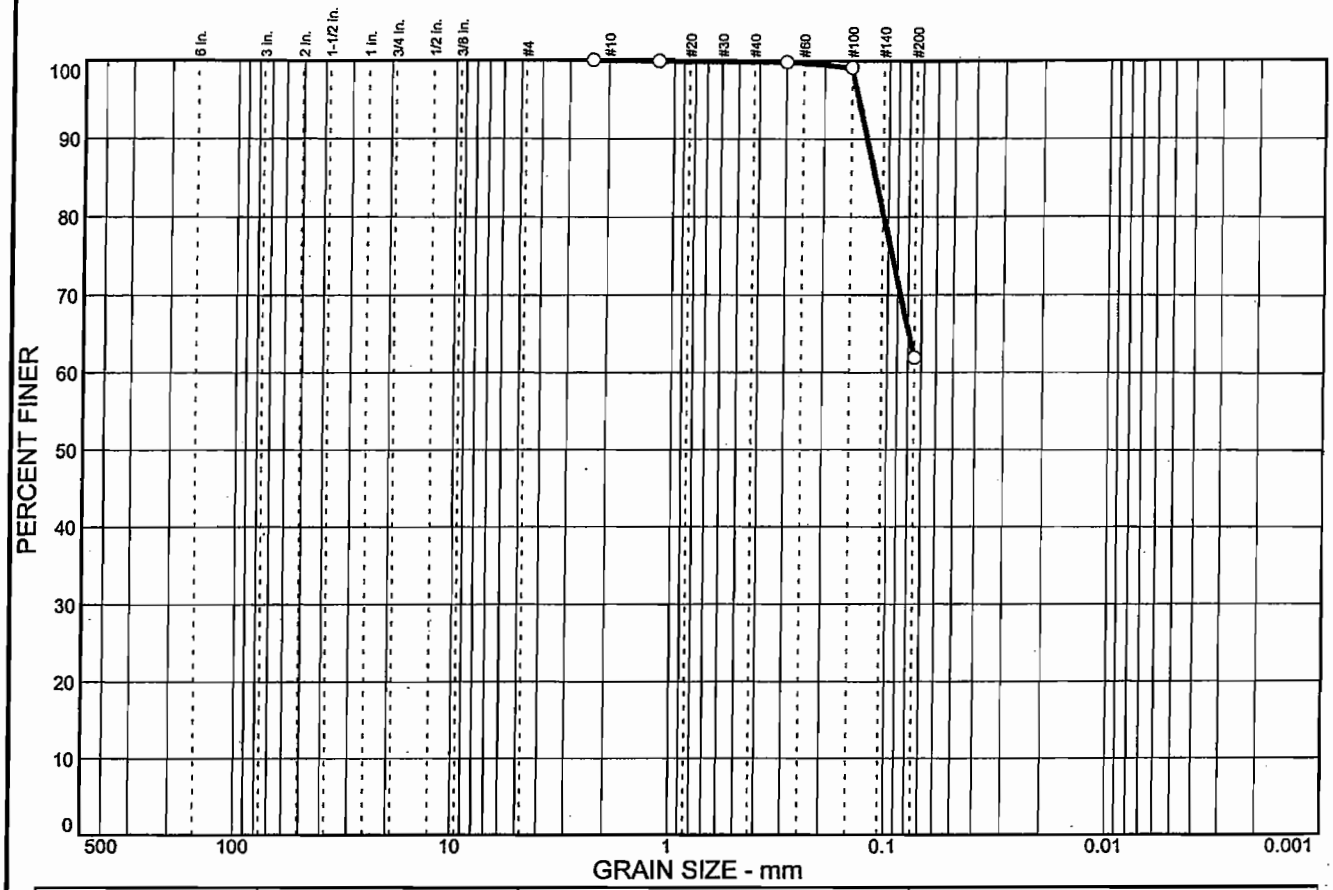
KTI

Client: C.D.M.

Project: Turkey Creek Pump Station

Project No: 304160G **Page**

Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.0	0.2	37.9	61.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#8	100.0		
#16	99.9		
#50	99.8		
#100	99.1		
#200	61.9		

* (no specification provided)

Soil Description

Sandy silt

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.115 D_{60}= D_{50}=
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= ML AASHTO=

Remarks

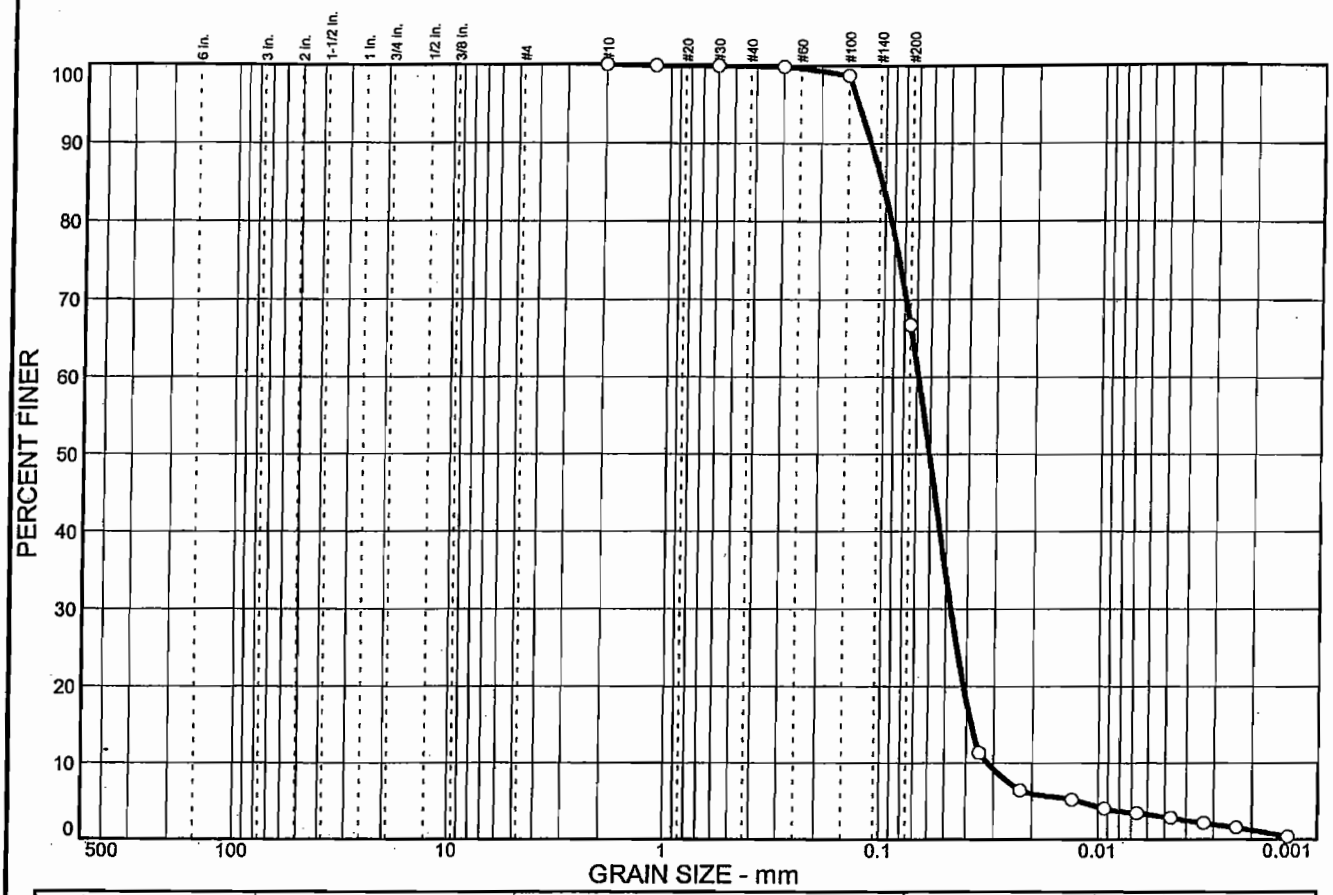
Specific gravity of 2.65 assumed

Sample No.: Sieve analysis **Source of Sample:** **Date:** 10/06/04
Location: B-3 S-8 @ 33.5-35.0' **Elev./Depth:**

KTI

Client: C.D.M.
Project: Turkey Creek Pump Station
Project No: 304160G **Page**

Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	0.0	0.0	0.1	33.2	63.8	2.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#10	100.0		
#16	99.9		
#30	99.9		
#50	99.8		
#100	98.7		
#200	66.7		

* (no specification provided)

Soil Description

Sandy silt

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.104 D_{60}= 0.0685 D_{50}= 0.0606
D_{30}= 0.0475 D_{15}= 0.0379 D_{10}= 0.0319
C_u= 2.15 C_c= 1.03

Classification

USCS= ML AASHTO=

Remarks

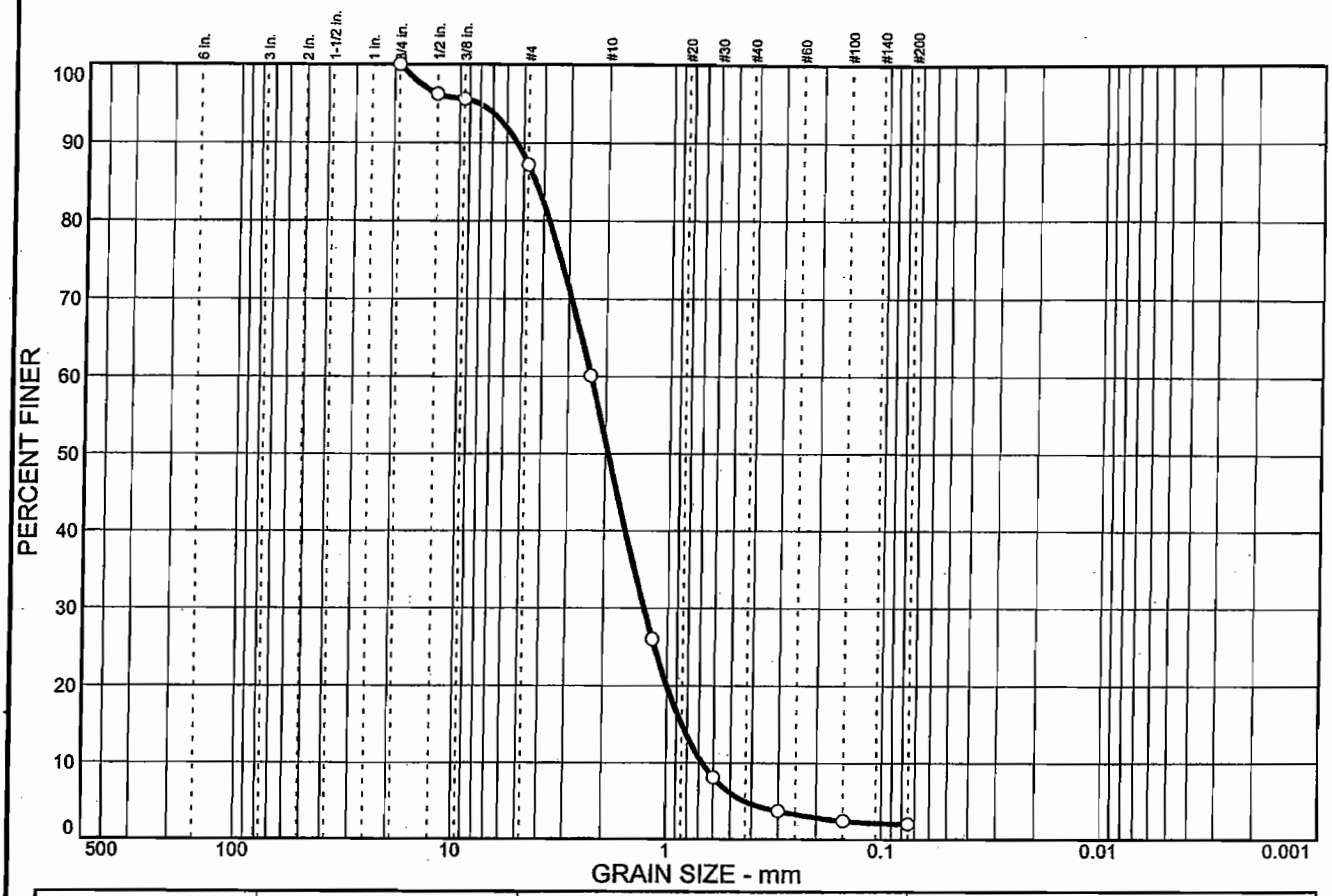
Specific gravity of 2.65 assumed

Sample No.: Hydrometer **Source of Sample:** **Date:** 10/06/04
Location: B-3 S-8 @ 33.5-35.0' **Elev./Depth:**

KTI

Client: C.D.M.
Project: Turkey Creek Pump Station
Project No: 304160G **Page**

Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	12.8	35.5	46.8	2.9	2.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
1/2 in.	96.2		
3/8 in.	95.6		
#4	87.2		
#8	60.1		
#16	26.0		
#30	8.1		
#50	3.7		
#100	2.4		
#200	2.0		

* (no specification provided)

Soil Description

Poorly graded sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 4.38 D_{60}= 2.36 D_{50}= 1.94
D_{30}= 1.30 D_{15}= 0.849 D_{10}= 0.676
C_u= 3.48 C_c= 1.05

Classification

USCS= SP AASHTO=

Remarks

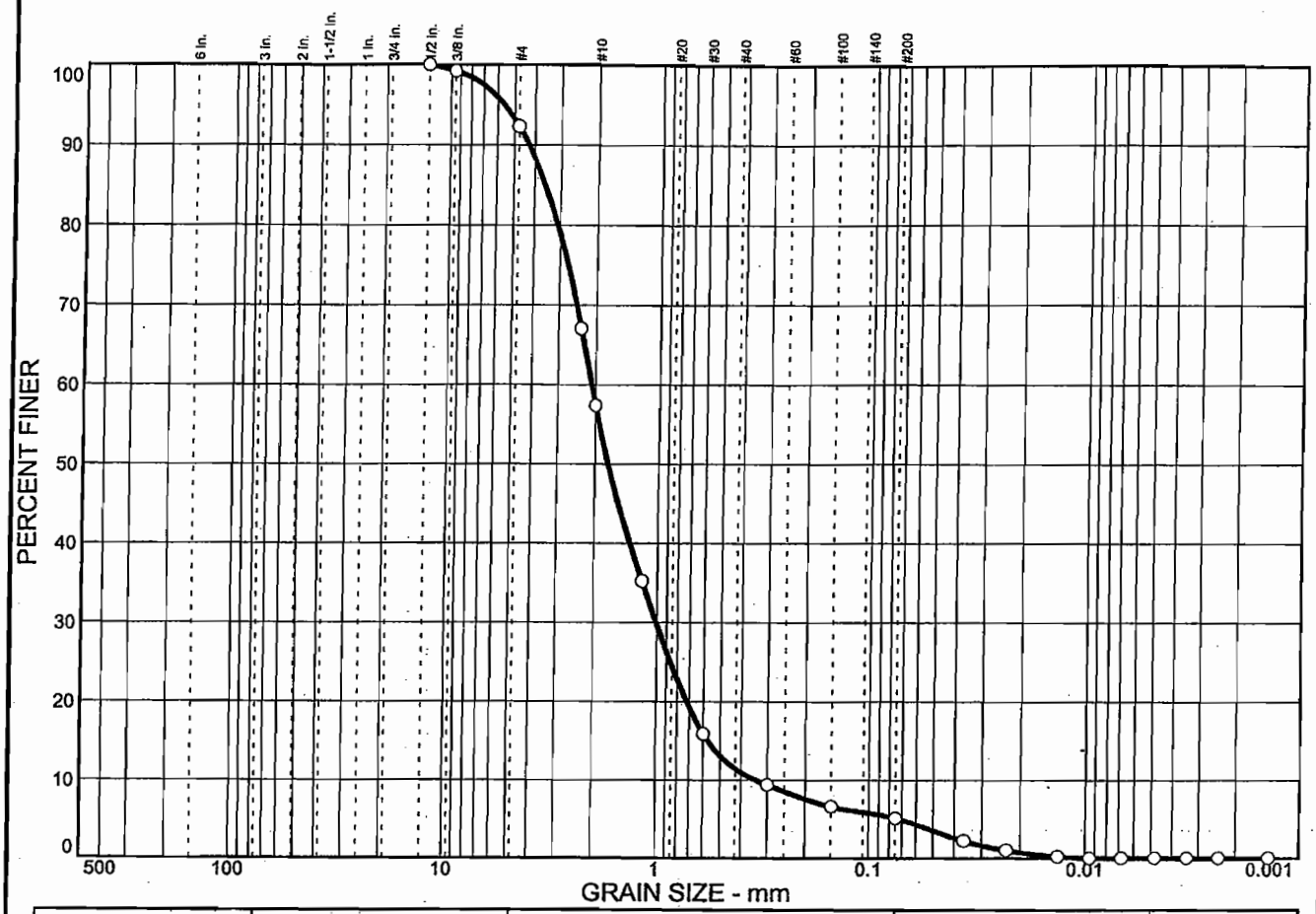
Specific gravity of 2.65 assumed

Sample No.: Sieve analysis **Source of Sample:** **Date:** 10/06/04
Location: B-3 S-10 @ 43.5-45.0' **Elev./Depth:**

KTI

Client: C.D.M.
Project: Turkey Creek Pump Station
Project No: 304160G **Page**

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	7.7	87.2	5.1	0.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/2 in.	100.0		
3/8 in.	99.2		
#4	92.3		
#8	67.1		
#10	57.4		
#16	35.2		
#30	15.9		
#50	9.4		
#100	6.6		
#200	5.1		

* (no specification provided)

Soil Description

Well-graded sand with silt

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 3.56 D_{60}= 2.09 D_{50}= 1.73
D_{30}= 1.01 D_{15}= 0.570 D_{10}= 0.340
C_u= 6.16 C_c= 1.44

Classification

USCS= SW-SM AASHTO=

Remarks

Specific gravity of 2.65 assumed

Hydrometer performed after sieve anaylsis

Sample No.: **Source of Sample:** **Date:** 10/06/04

Location: B-3 S-10 @ 43.5-45.0' **Elev./Depth:**

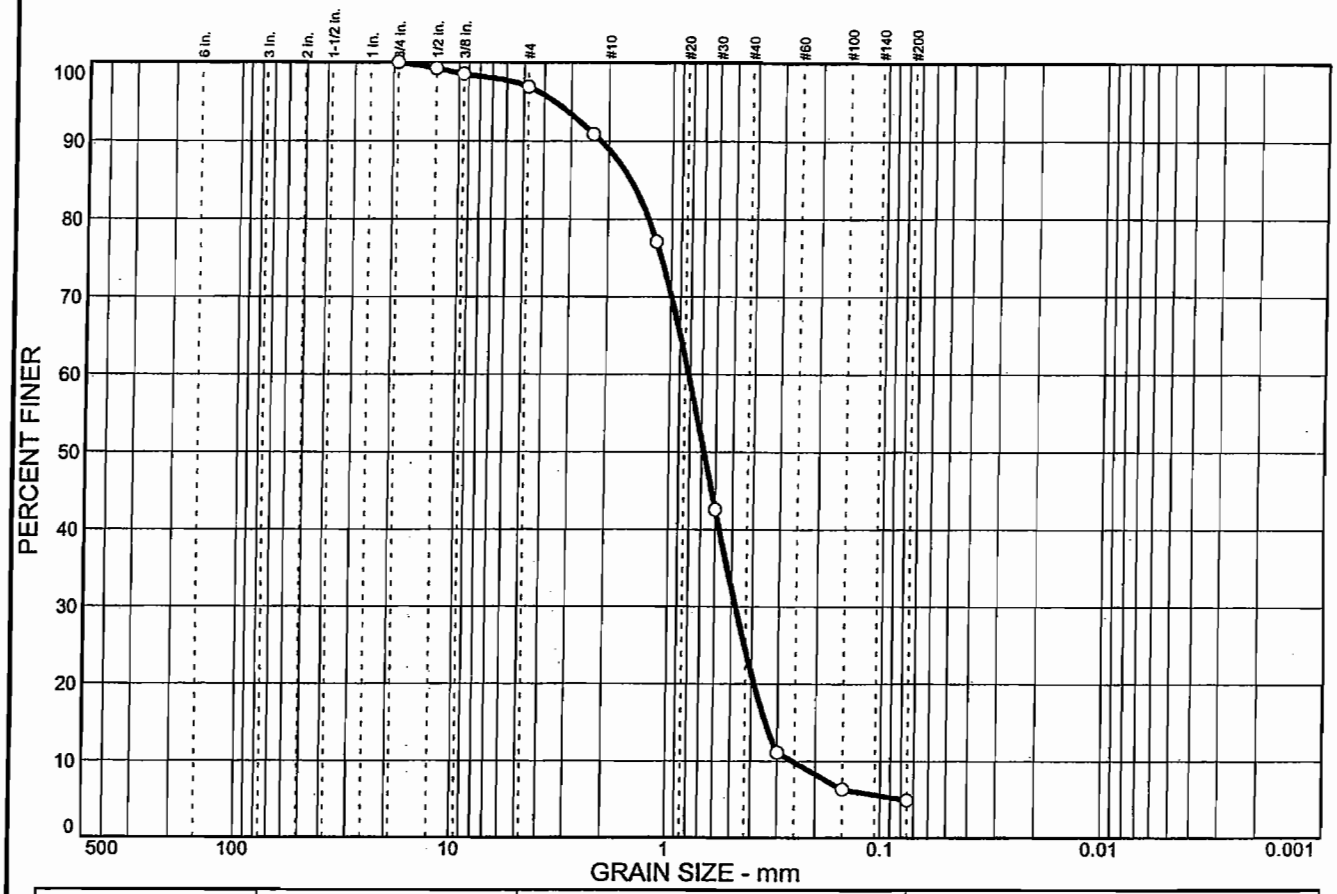
KTI

Client: C.D.M.

Project: Turkey Creek Pump Station

Project No: 304160G **Page**

Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	0.0	3.1	8.0	64.8	19.2	4.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/4 in.	100.0		
1/2 in.	99.2		
3/8 in.	98.5		
#4	96.9		
#8	90.9		
#16	77.1		
#30	42.6		
#50	11.1		
#100	6.3		
#200	4.9		

* (no specification provided)

Soil Description

Poorly graded sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 1.57 D_{60}= 0.817 D_{50}= 0.683
D_{30}= 0.477 D_{15}= 0.341 D_{10}= 0.256
C_u= 3.19 C_c= 1.09

Classification

USCS= SP AASHTO=

Remarks

Specific gravity of 2.65 assumed

Sample No.: **Source of Sample:** **Date:** 10/06/04

Location: B-3 S-12 @ 58.5-60.0' **Elev./Depth:**

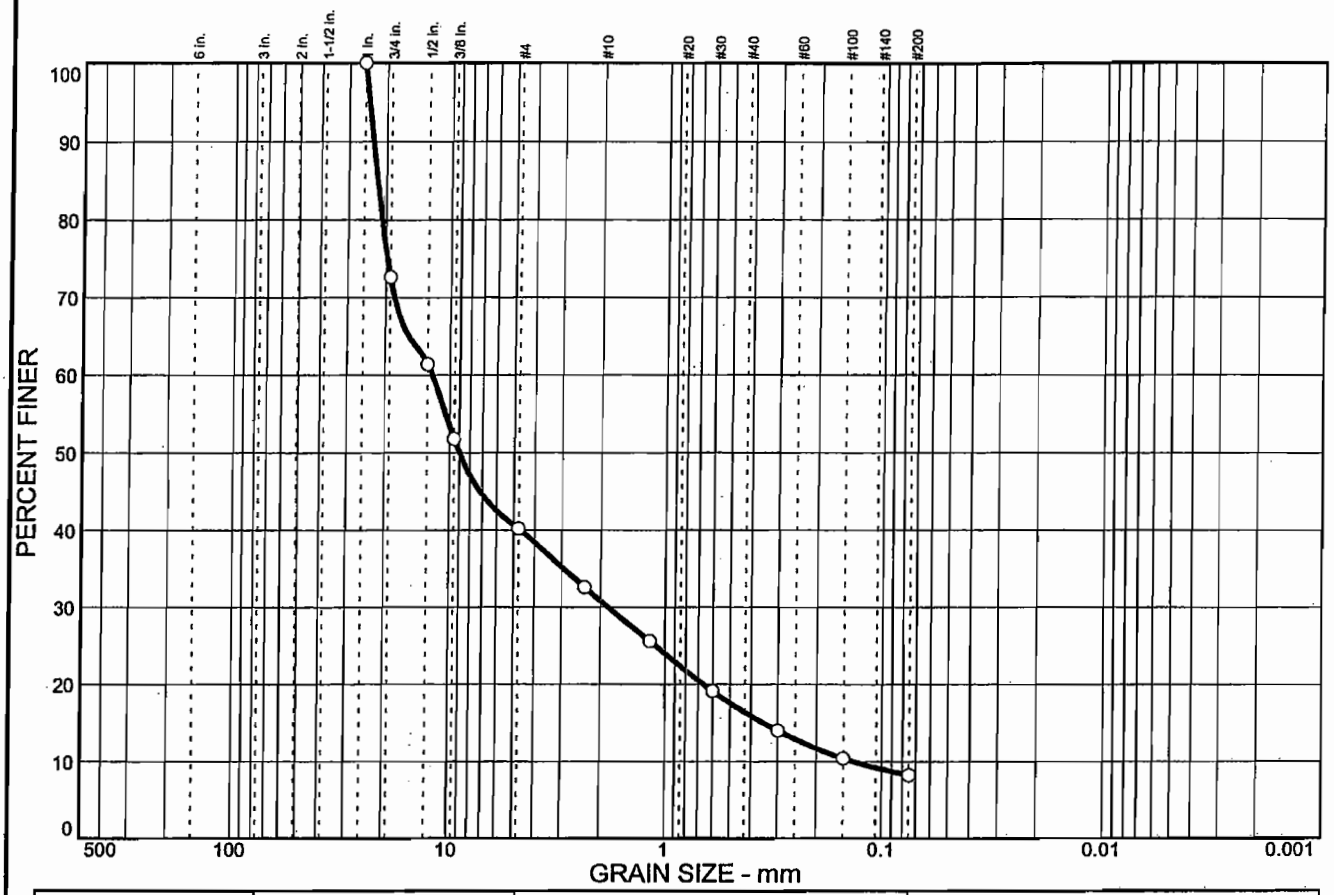
KTI

Client: C.D.M.

Project: Turkey Creek Pump Station

Project No: 304160G **Page**

Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	27.4	32.4	9.4	14.5	8.1	8.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100.0		
3/4 in.	72.6		
1/2 in.	61.4		
3/8 in.	51.8		
#4	40.2		
#8	32.6		
#16	25.6		
#30	19.1		
#50	14.0		
#100	10.4		
#200	8.2		

* (no specification provided)

Soil Description

Well-graded gravel with silt and sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 22.1 D_{60}= 12.1 D_{50}= 8.99
D_{30}= 1.84 D_{15}= 0.350 D_{10}= 0.135
C_u= 89.18 C_c= 2.08

Classification

USCS= GW-GM AASHTO=

Remarks

Specific gravity of 2.65 assumed

Sample No.: **Source of Sample:** **Date:** 10/06/04

Location: B-3 S-14 @ 78.5-80.0' **Elev./Depth:**

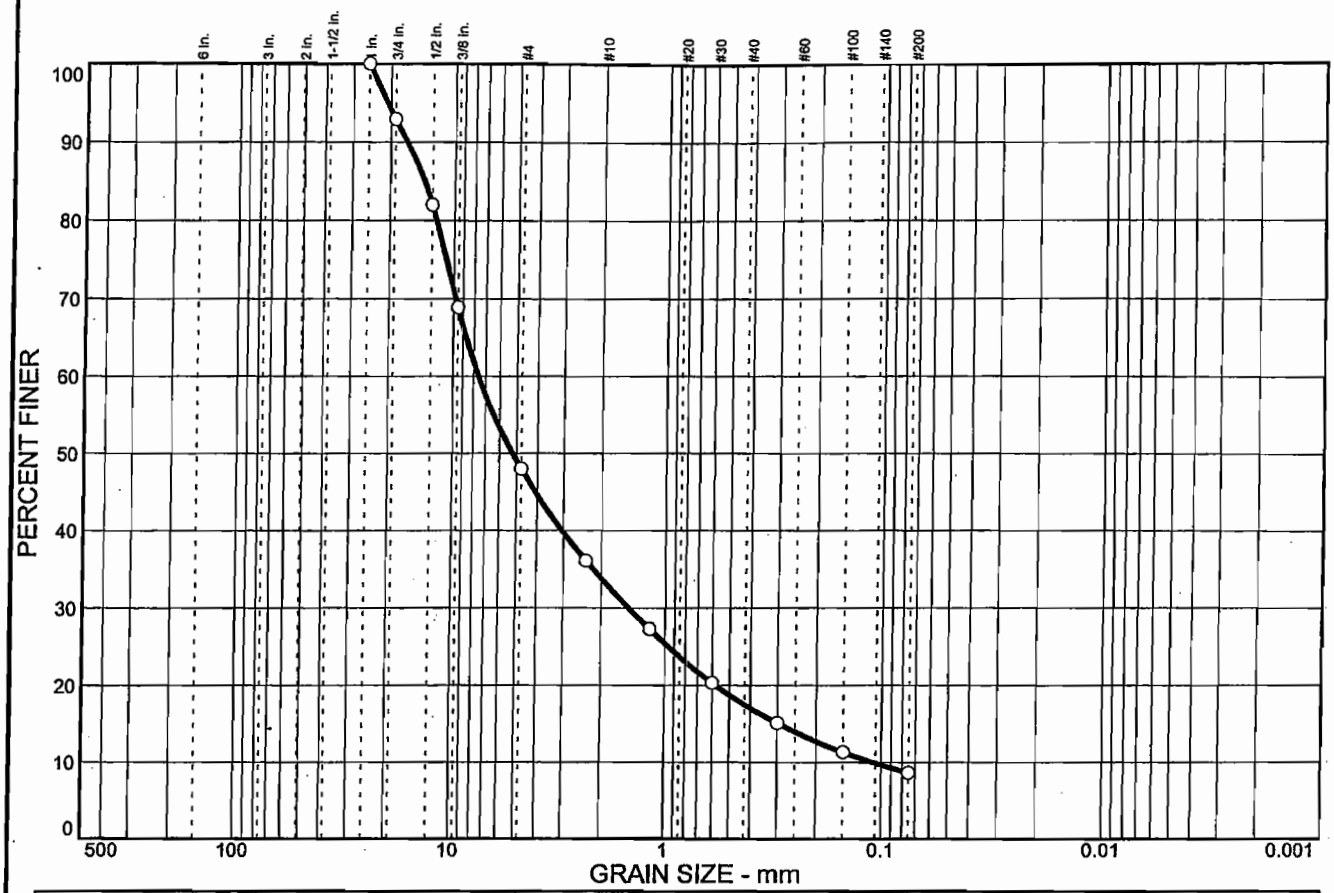
KTI

Client: C.D.M.

Project: Turkey Creek Pump Station

Project No: 304160G **Page**

Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	7.1	44.9	14.2	16.3	8.9	8.6	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100.0		
3/4 in.	92.9		
1/2 in.	82.0		
3/8 in.	68.9		
#4	48.0		
#8	36.1		
#16	27.3		
#30	20.3		
#50	15.1		
#100	11.3		
#200	8.6		

* (no specification provided)

Soil Description

Well-graded gravel with silt and sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 13.8 D_{60}= 7.57 D_{50}= 5.22
D_{30}= 1.48 D_{15}= 0.295 D_{10}= 0.110
C_u= 68.90 C_c= 2.65

Classification

USCS= GW-GM AASHTO=

Remarks

Specific gravity of 2.65 assumed

Sample No.: **Source of Sample:** **Date:** 10/06/04

Location: B-3 S-16 @ 93.5-95.0' **Elev./Depth:**

KTI

Client: C.D.M.

Project: Turkey Creek Pump Station

Project No: 304160G **Page**

GLOSSARY OF GEOTECHNICAL TERMS

ALLUVIUM	Sediments deposited by streams, including riverbeds and floodplains.
ARGILLACEOUS	Rocks composed of or having a notable portion of fine silt and/or clay in their composition.
ATTERBERG LIMITS	Water contents, in percentage of dry weight of soil, that correspond to the boundaries between the states of consistency, i.e. the boundary between the liquid and plastic states (liquid limit) and the boundary between the plastic and solid states (plastic limit).
BEDROCK-IN-PLACE	Continuous rock mass which essentially has not moved from its original depositional position.
CALCAREOUS	Containing calcium carbonate determined by effervescence when tested with dilute hydrochloric acid.
COLLUVIAL	Rock debris of various sizes loose from in-place bedrock mass, often shifted down gradient in conjunction with soil.
CROSS-BEDDING	Stratification which is inclined to the original horizontal surface upon which the sediment accumulated.
FISSILE BEDDING	Term applied to bedding which consists of laminae less than 2 millimeters in thickness.
FORMATION	A distinctive body of rock that serves as a convenient unit for study and mapping.
FOSSIL DETRITUS	The accumulation of broken, fragmented fossil debris.
FOSSILIFEROUS	Containing organic remains.
GLACIAL ERRATIC	A transported rock fragment different from the bedrock on which it lies, either free or as part of a sediment.
GLACIAL TILL	Nonsorted, nonstratified sediment carried or deposited by a glacier.
GLACIOFLUVIAL	Primarily deposited by streams from glaciers.
GROUP	A lithostratigraphic unit consisting of two or more formations.
JOINT	A fracture in a rock along which no appreciable displacement has occurred.
LIMESTONE	A sedimentary rock composed mostly of calcium carbonate ($CaCO_3$).

LOESS	A homogenous, nonstratified, unindurated deposit consisting predominantly of silt, with subordinate amounts of very fine sand and/or clay.
MICA	A mineral group, consisting of phyllosilicates, with sheetlike structures.
MEMBER	A specially developed part of a varied formation is called a member, if it has considerable geographic extent.
NODULE	A small, irregular, knobby, or rounded rock that is generally harder than the surrounding rock.
PERMEABILITY	The capacity of a material to transmit a fluid.
PETROLIFEROUS	Containing or yielding petroleum.
RECOVERY	The percentage of bedrock core recovered from a core run length.
RELIEF	The difference in elevation between the high and low points of a land surface.
RESIDUAL SOIL	Soil formed in place by the disintegration and decomposition of rocks and the consequent weathering of the mineral materials.
ROCK QUALITY DESIGNATION (RQD)	Refers to percentage of core sample recovered in unbroken lengths of 4 inches or more.
SANDSTONE	Sedimentary rock composed mostly of sand sized particles, usually cemented by calcite, silica, or iron oxide.
SERIES	A time-stratigraphic unit ranked next below a system.
SHALE	A fine-grained sedimentary rock composed primarily of clay, but often containing lesser amounts of silt and/or sand.
STRATIGRAPHY	Branch of geology that treats the formation, compositions, sequence, and correlation of the stratified rocks as parts of the earth's crust.
SYSTEM	Designates rocks formed during a fundamental chronological unit, a period.
UNCONFORMITY	A surface of erosion or nondeposition, usually the former, which separates younger strata from older rocks.
WEATHERING	The physical and chemical disintegration and decomposition of rocks and minerals.

General Notes

Laboratory Test Symbols	
Symbol	**Definition**
LL	Liquid Limit (ASTM D4318)
PL	Plastic Limit (ASTM D4318)
PI	Plasticity Index (LL minus PL)
Qu	Unconfined Compressive Strength, Pounds per Square Foot (psf)
Qp	Pocket Penetrometer Reading, Tons per Square Foot (TSF)
RQD	Rock Quality Designation % (Sum of rock core pieces >4 inches/length of core run)

Common Soil Classification Symbols

Clay	
Symbol	**Soil Type**
CL	Low plasticity clay
CL-ML	Low plasticity clay and silt
CL/CH	Medium plasticity clay
CH	High plasticity clay

Silt	
Symbol	**Soil Type**
ML	Low plasticity silt
MH	High plasticity silt

Sand	
Symbol	**Soil Type**
SW	Well graded sand
SP	Poorly graded sand
SM	Silty sand
SC	Clayey sand

Gravel	
Symbol	**Soil Type**
GW	Well graded gravel
GP	Poorly graded gravel
GM	Silty gravel
GC	Clayey gravel

Descriptive Terminology

Cohesionless Soils

Relative Density Term	"N" Value
Very Loose	0 - 4
Loose	5 - 9
Medium Dense	10 - 29
Dense	30 – 49
Very Dense	50 or more

Cohesive Soils

Consistency Term	"N" Value
Very soft	0 – 2
Soft	3 – 4
Medium	5 – 8
Stiff	9 – 15
Very Stiff	16 - 30
Hard	> 30

Relative Proportions and Sizes

Term	Range
Trace	< 5%
A Little	5 – 15%
Some	15 – 30%
With	30 – 50%

Material	Size
Boulder	> 12"
Cobble	3" – 12"
Gravel	4.75 - 76.2 mm
Sand	0.075 – 4.75 mm
Silt and Clay	< 0.075 mm

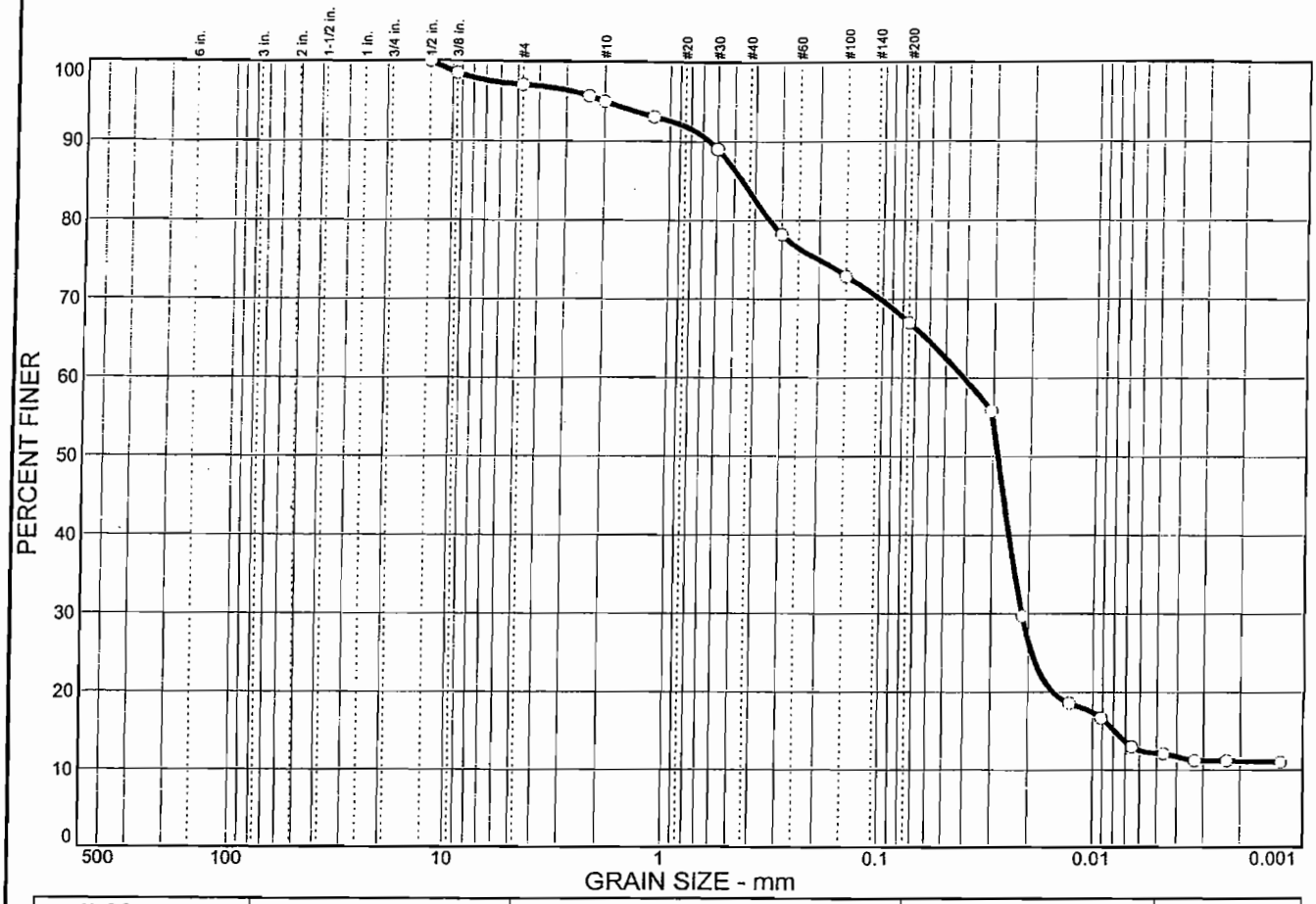
LABORATORY TEST RESULTS B4 THRU B5

SUMMARY OF LABORATORY RESULTS

Boring	Depth (Ft)	Sample No./Type	Natural Moisture %	Natural Dry Density (pcf)	Unconfined Compressive Strength (psf)	Atterberg Limits		Swell/Consolidation		Soil Type
						Liquid Limit %	Plasticity Index %	Swell Pressure (psf)	Volume Change %	
4	1.0-2.5	1, SS	17.1							
4	3.5-5.0	2, SS								
4	6.0-7.5	3, SS	16.5							
4	8.5-9.5	4, SS								
4	11.0-12.5	5, SS	25.1							
4	13.5-15.0	6, SS								
4	16.0-17.5	7. SS								
4	18.5-20.0	8, SS								
4	21.0-22.5	9, SS								
4	23.5-25.0	10, SS								
4	26.0-27.5	11, SS								
4	28.5-30.0	12, SS								
4	31.0-32.5	13, SS								
4	33.5-35.0	14, SS								
4	36.0-37.5	15, SS								
4	38.5-40.0	16, SS								
4	41.0-42.5	17, SS								
4	43.5-45.0	18, SS								
4	46.0-47.5	19, SS								
4	48.5-50.0	20, SS								
4	51.0-52.5	21, SS								
4	53.5-55.0	22, SS								
4	56.0-57.5	23, SS								
4	58.5-60.0	24, SS								
4	61.0-62.5	25, SS								
4	63.5-65.0	26, SS								

Boring	Depth (Ft)	Sample No./Type	Natural Moisture %	Natural Dry Density (pcf)	Unconfined Compressive Strength (psf)	Atterberg Limits		Swell/Consolidation		Soil Type
						Liquid Limit %	Plasticity Index %	Swell Pressure (psf)	Volume Change %	
4	66.0-67.5	27, SS								
4	68.5-69.3	28, SS								
5	0-5.0	1, CONT.								
5	5.0-15.0	2, CONT.								
5	15.0-25.0	3, CONT.								
5	25.0-35.0	4, CONT.								
5	35.0-45.0	5, CONT.								
5	45.0-55.0	6, CONT.								
5	55.0-65.0	7, CONT.								
5	65.0-75.0	8, CONT.								
5	75.0-85.0	9, CONT.								

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	2.9	30.1	54.8	12.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/2 in.	100.0		
3/8 in.	98.5		
#4	97.1		
#8	95.7		
#10	95.0		
#16	93.1		
#30	89.0		
#50	78.2		
#100	72.9		
#200	67.0		

* (no specification provided)

Soil Description

Sandy silt

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.461 D_{60}= 0.0414 D_{50}= 0.0286
D_{30}= 0.0216 D_{15}= 0.0079 D_{10}=
C_u= C_c=

Classification

USCS= ML AASHTO=

Remarks

Specific gravity of 2.65 assumed

Sample No.: **Source of Sample:** **Date:** 4/13/05

Location: B-4 S-6 @ 13.5-15.0' **Elev./Depth:**

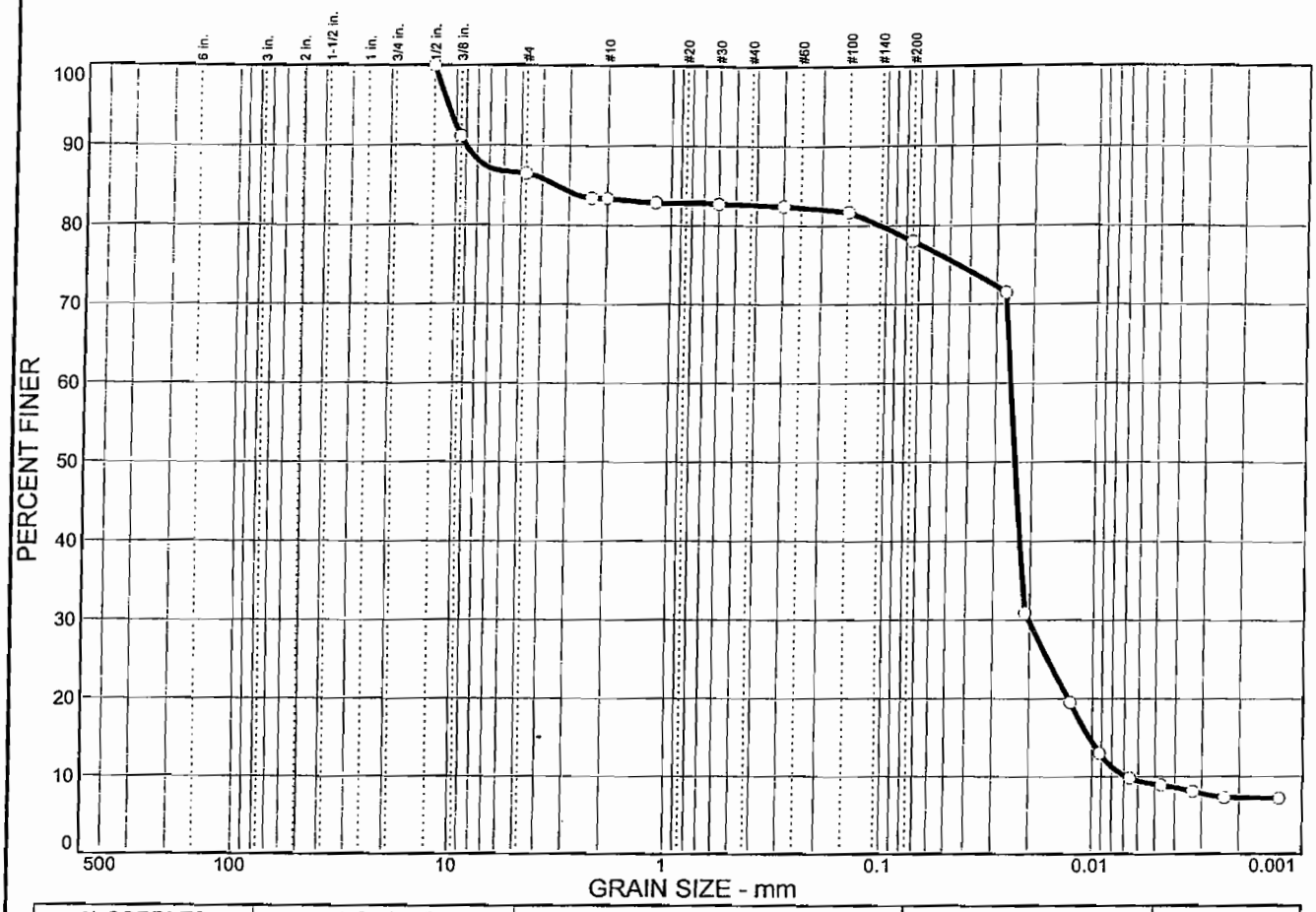
KTI

Client: Camp, Dresser & McKee

Project: Turkey Creek Pump Station

Project No: 305029G **Plate** 1 of 3

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	13.5	8.5	69.0	9.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/2 in.	100.0		
3/8 in.	91.1		
#4	86.5		
#8	83.4		
#10	83.4		
#16	82.9		
#30	82.7		
#50	82.4		
#100	81.7		
#200	78.0		

* (no specification provided)

Soil Description

Silt with gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 3.43 D_{60}= 0.0254 D_{50}= 0.0240
D_{30}= 0.0202 D_{15}= 0.0103 D_{10}= 0.0068
C_u= 3.72 C_c= 2.36

Classification

USCS= ML AASHTO=

Remarks

Specific gravity of 2.65 assumed

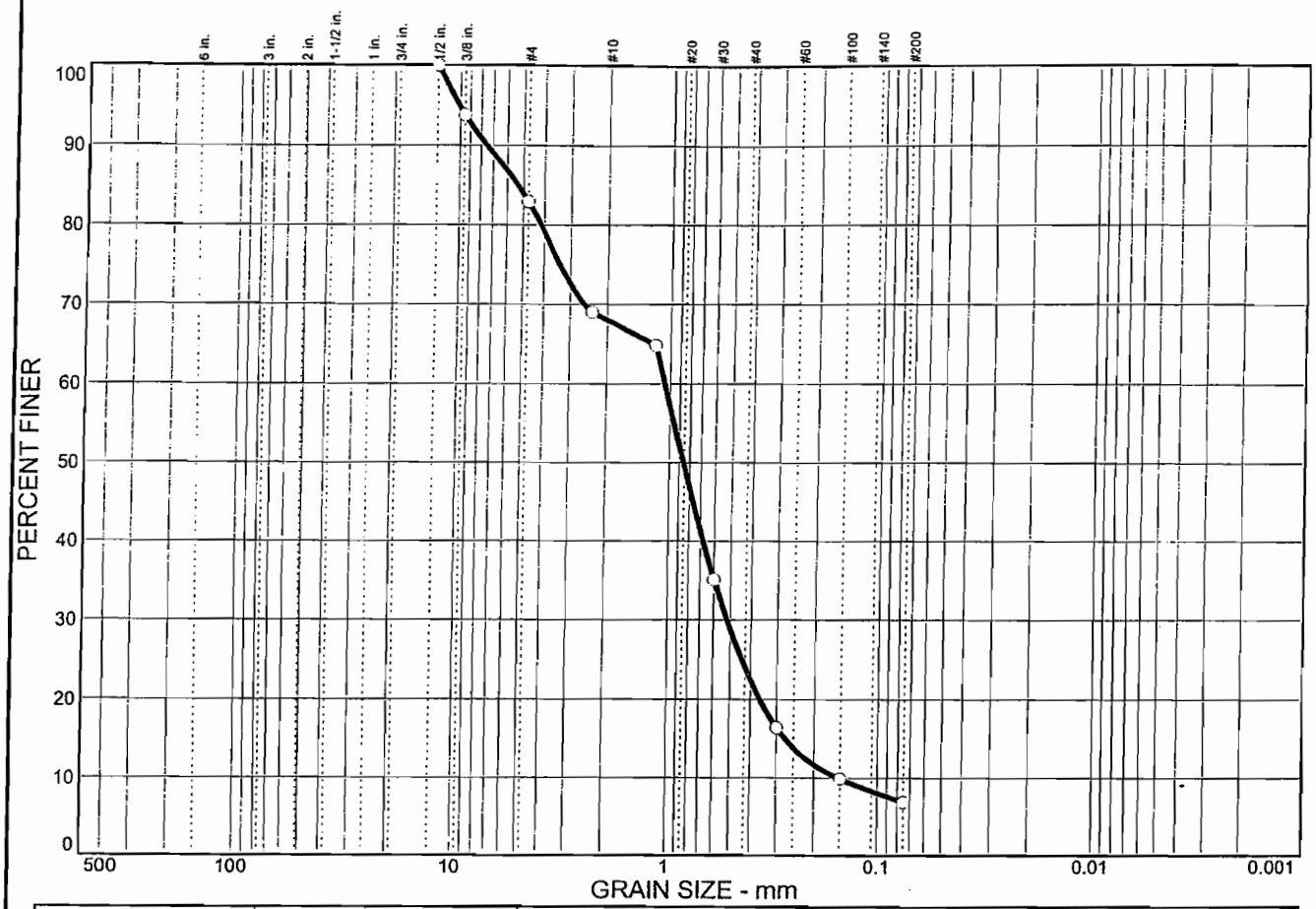
Sample No.: **Source of Sample:** **Date:** 4/13/05
Location: B-4 S-20 @ 48.5-50.0' **Elev./Depth:**

KTI

Client: Camp, Dresser & McKee
Project: Turkey Creek Pump Station

Project No: 305029G **Plate** 2 of 3

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	17.1	76.0	6.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1/2 in.	100.0		
3/8 in.	93.8		
#4	82.9		
#8	69.0		
#16	64.8		
#30	35.1		
#50	16.4		
#100	9.9		
#200	6.9		

* (no specification provided)

Soil Description

Well-graded sand with silt and gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 5.33 D_{60}= 1.07 D_{50}= 0.858
D_{30}= 0.519 D_{15}= 0.274 D_{10}= 0.153
C_u= 6.97 C_c= 1.65

Classification

USCS= SW-SM AASHTO=

Remarks

Specific gravity of 2.65 assumed

Sample No.: **Source of Sample:** **Date:** 4/13/05

Location: B-4 S-26 @ 63.5-65.0' **Elev./Depth:**

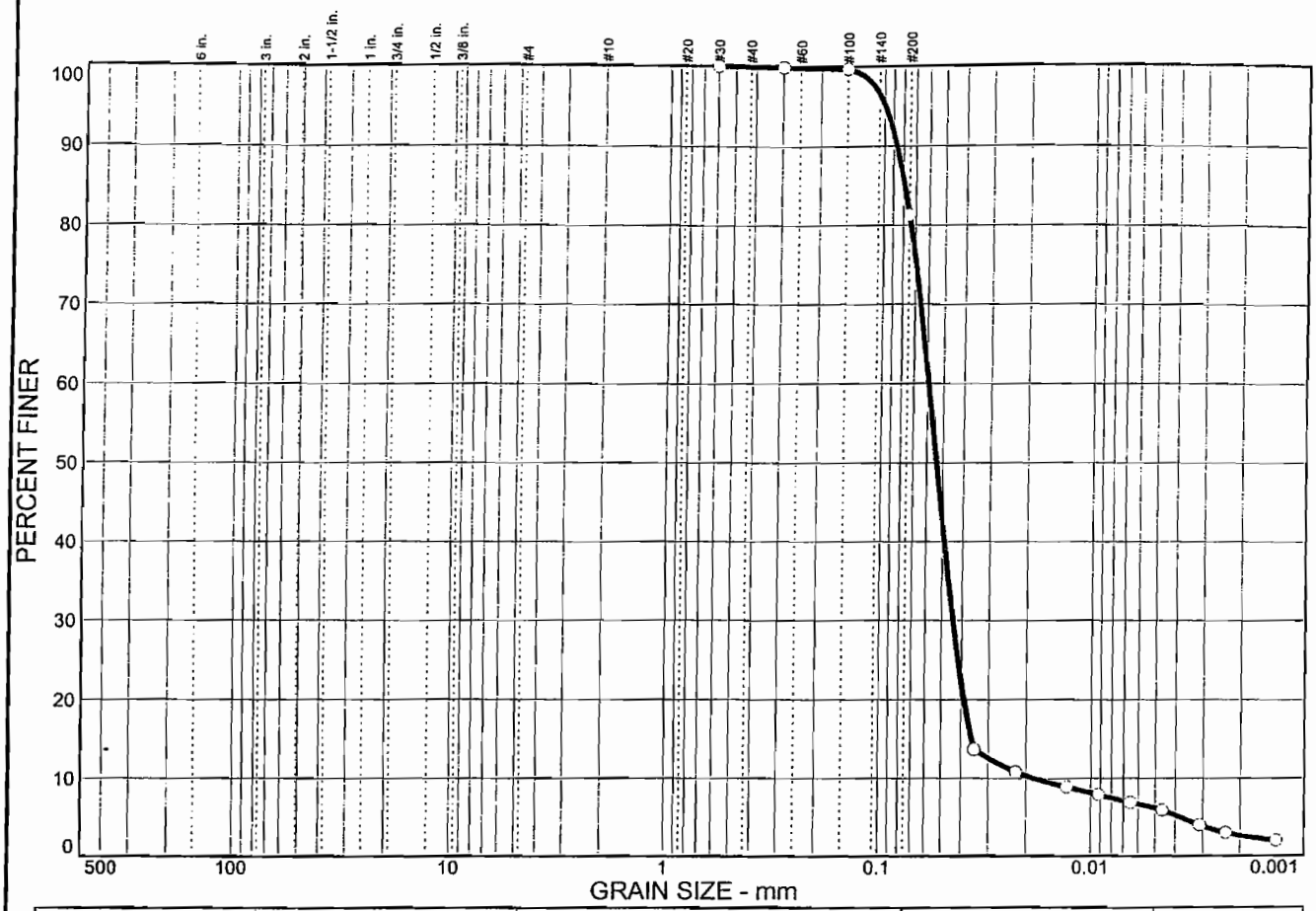
KTI

Client: Camp, Dresser & McKee

Project: Turkey Creek Pump Station

Project No: 305029G **Plate** 3 of 3

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	18.7	75.1	6.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#30	100.0		
#50	99.9		
#100	99.7		
#200	81.3		

* (no specification provided)

Soil Description

Silt with sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.0792 D_{60}= 0.0593 D_{50}= 0.0539
D_{30}= 0.0441 D_{15}= 0.0360 D_{10}= 0.0183
C_u= 3.23 C_c= 1.79

Classification

USCS= ML AASHTO=

Remarks

Specific gravity of 2.65 assumed

Sample No.: **Source of Sample:** **Date:** 4/13/05

Location: B-4 S-11 @ 26.0-27.5' **Elev./Depth:**

KTI

Client: Camp, Dresser & McKee

Project: Turkey Creek Pump Station

Project No: 305029G **Plate**

M.D. Chemical and Testing, Inc.
P.O. Box 19321, Forbes Field, Bldg 281, Topeka, KS 66619
Kansas Certification No. E-10135 (785)862-3500 fax(785)862-5132

Sample Collected By: Brian Redlinger
Received In lab: 4/12/05
Date Reported: 4/12/05
Project Name:
Project Number:

Lab Number: 1051899
Client: Kruger Tech, Inc.
14705 West 114th Terr.
Lenexa, KS 66215

ATTN: Laura Wagner

Analysis	Method	Result	Detection Limit	Units	Date Analyzed	Analyst
1051899-01 **Sample ID:** 305029G B-4 **Sampled:** 4/8/05						
Sodium	EPA 200.7	53.9	[0.01]	mg/L(ppm)	4/12/05	HK
1051899-02 **Sample ID:** 305029G B-5 **Sampled:** 4/8/05						
Sodium	EPA 200.7	33.9	[0.01]	mg/L(ppm)	4/12/05	HK

Samples preserved with nitric acid.

Approved By: _____
Lab Manager

GLOSSARY OF GEOTECHNICAL TERMS

ALLUVIUM	Sediments deposited by streams, including riverbeds and floodplains.
ARGILLACEOUS	Rocks composed of or having a notable portion of fine silt and/or clay in their composition.
ATTERBERG LIMITS	Water contents, in percentage of dry weight of soil, that correspond to the boundaries between the states of consistency, i.e. the boundary between the liquid and plastic states (liquid limit) and the boundary between the plastic and solid states (plastic limit).
BEDROCK-IN-PLACE	Continuous rock mass which essentially has not moved from its original depositional position.
CALCAREOUS	Containing calcium carbonate determined by effervescence when tested with dilute hydrochloric acid.
COLLUVIAL	Rock debris of various sizes loose from in-place bedrock mass, often shifted down gradient in conjunction with soil.
CROSS-BEDDING	Stratification which is inclined to the original horizontal surface upon which the sediment accumulated.
FISSILE BEDDING	Term applied to bedding which consists of laminae less than 2 millimeters in thickness.
FORMATION	A distinctive body of rock that serves as a convenient unit for study and mapping.
FOSSIL DETRITUS	The accumulation of broken, fragmented fossil debris.
FOSSILIFEROUS	Containing organic remains.
GLACIAL ERRATIC	A transported rock fragment different from the bedrock on which it lies, either free or as part of a sediment.
GLACIAL TILL	Nonsorted, nonstratified sediment carried or deposited by a glacier.
GLACIOFLUVIAL	Primarily deposited by streams from glaciers.
GROUP	A lithostratigraphic unit consisting of two or more formations.
JOINT	A fracture in a rock along which no appreciable displacement has occurred.
LIMESTONE	A sedimentary rock composed mostly of calcium carbonate ($CaCO_3$).
LOESS	A homogenous, nonstratified, unindurated deposit consisting

	predominantly of silt, with subordinate amounts of very fine sand and/or clay.
MICA	A mineral group, consisting of phyllosilicates, with sheetlike structures.
MEMBER	A specially developed part of a varied formation is called a member, if it has considerable geographic extent.
NODULE	A small, irregular, knobby, or rounded rock that is generally harder than the surrounding rock.
PERMEABILITY	The capacity of a material to transmit a fluid.
PETROLIFEROUS	Containing or yielding petroleum.
RECOVERY	The percentage of bedrock core recovered from a core run length.
RELIEF	The difference in elevation between the high and low points of a land surface.
RESIDUAL SOIL	Soil formed in place by the disintegration and decomposition of rocks and the consequent weathering of the mineral materials.
ROCK QUALITY DESIGNATION (RQD)	Refers to percentage of core sample recovered in unbroken lengths of 4 inches or more.
SANDSTONE	Sedimentary rock composed mostly of sand sized particles, usually cemented by calcite, silica, or iron oxide.
SERIES	A time-stratigraphic unit ranked next below a system.
SHALE	A fine-grained sedimentary rock composed primarily of clay, but often containing lesser amounts of silt and/or sand.
STRATIGRAPHY	Branch of geology that treats the formation, compositions, sequence, and correlation of the stratified rocks as parts of the earth's crust.
SYSTEM	Designates rocks formed during a fundamental chronological unit, a period.
UNCONFORMITY	A surface of erosion or nondeposition, usually the former, which separates younger strata from older rocks.
WEATHERING	The physical and chemical disintegration and decomposition of rocks and minerals.

General Notes

Laboratory Test Symbols	
Symbol	**Definition**
LL	Liquid Limit (ASTM D4318)
PL	Plastic Limit (ASTM D4318)
PI	Plasticity Index (LL minus PL)
Qu	Unconfined Compressive Strength, Pounds per Square Foot (psf)
Qp	Pocket Penetrometer Reading, Tons per Square Foot (TSF)
RQD	Rock Quality Designation % (Sum of rock core pieces >4 inches/length of core run)

Common Soil Classification Symbols

Clay	
Symbol	**Soil Type**
CL	Low plasticity clay
CL-ML	Low plasticity clay and silt
CL/CH	Medium plasticity clay
CH	High plasticity clay

Silt	
Symbol	**Soil Type**
ML	Low plasticity silt
MH	High plasticity silt

Sand	
Symbol	**Soil Type**
SW	Well graded sand
SP	Poorly graded sand
SM	Silty sand
SC	Clayey sand

Gravel	
Symbol	**Soil Type**
GW	Well graded gravel
GP	Poorly graded gravel
GM	Silty gravel
GC	Clayey gravel

Descriptive Terminology

Cohesionless Soils

Relative Density Term	"N" Value
Very Loose	0 - 4
Loose	5 - 9
Medium Dense	10 - 29
Dense	30 – 49
Very Dense	50 or more

Cohesive Soils

Consistency Term	"N" Value
Very soft	0 – 2
Soft	3 – 4
Medium	5 – 8
Stiff	9 – 15
Very Stiff	16 - 30
Hard	> 30

Relative Proportions and Sizes

Term	Range
Trace	< 5%
A Little	5 – 15%
Some	15 – 30%
With	30 – 50%

Material	Size
Boulder	> 12"
Cobble	3" – 12"
Gravel	4.75 - 76.2 mm
Sand	0.075 – 4.75 mm
Silt and Clay	< 0.075 mm

REPORT OF GEOTECHNICAL EXPLORATION
PUMP STATION PHASE II
TURKEY CREEK PUMPING STATION
KANSAS CITY, MISSOURI

Presented to:

CAMP, DRESSER & MCKEE
Kansas City, Missouri

Attn: Mr. Kurt Ronnekamp, P.E.

Prepared by:

Gary J. Van Riessen, P.E.
Laura E. Wagner

KTI
Lenexa, Kansas

KTI Project No. 305029G

April 14, 2005

April 14, 2005

Mr. Kurt Ronnekamp, P.E.
Camp, Dresser & McKee
9200 Ward Parkway, Suite 500
Kansas City, Missouri 64114

Re: KTI Project No. 305029G
Pump Station Phase II
Turkey Creek Pumping Station
Kansas City, Missouri

Dear Mr. Ronnekamp:

KTI has completed the subsurface exploration and geotechnical report for the above referenced project. The purpose of this report is to describe the surface and subsurface conditions encountered at the site, present laboratory test results, analyze and evaluate this information, and prepare a summary of existing conditions, subsurface material characteristics, and geotechnical design recommendations.

We thank you for the opportunity to work with Camp, Dresser & McKee. If you have any questions, please contact us at 913.498.1114.

Respectfully submitted,
Kruger Technologies, Inc.

Gary J. Van Riessen, P.E.
Missouri: EN-019058

Laura E. Wagner, E.I.T.
Geotechnical Engineer

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REPORT OF GEOTECHNICAL EXPLORATION
PUMP STATION PHASE II
TURKEY CREEK PUMPING STATION
KANSAS CITY, MISSOURI

INTRODUCTION

This report presents the findings and subsequent recommendations concerning the geotechnical exploration and engineering analysis for the proposed rockbox at the Turkey Creek Pumping Station, in Kansas City, Missouri.

The purpose of this report is to describe the surface and subsurface conditions encountered at the site, submit laboratory test results, analyze and evaluate this information, and present a summary of existing conditions, subsurface characteristics, and geotechnical design recommendations.

FIELD EXPLORATION PROCEDURES

Three test borings for the proposed improvements to the Turkey Creek Pumping Station were completed on September 20 and 21, 2004. Information regarding the original three borings B-1, B-2, and B-3 may be obtained from the KTI Geotechnical Report No. 304160G dated November 12, 2004. Boring logs for borings B-1, B-2, and B-3 have been provided in Appendix I. Two additional borings were drilled on February 26, 2005 and April 8, 2005. The test hole locations were selected and field staked with reference to existing landmarks by Kruger Technologies, Inc.

Four borings were drilled with a truck mounted CME-75 drill rig. Advancement of the test holes was accomplished using 3¼-inch I.D. hollow stem augers, and wash bore techniques. Soil sampling was performed by driving split-barrel samplers (Standard Penetration Test). The remaining boring was drilled with a truck mounted GP 24-300 rotosonic drill rig. Advancement of the test hole was accomplished using a 3 ½ -inch I.D. sleeve and sonic drilling techniques. Soil sampling was performed by a 10-feet long sampling string within the drill pipe.

Site soils were visually and manually classified in general accordance with ASTM D 2488 by the drill crew chief as drilling progressed. All of the soil samples were delivered to the laboratory for applicable testing and verification of the field classifications. The boring logs were created as the borings were advanced, and the logs were supplemented with information from the laboratory tests to present data concerning the depth and classification of the various strata, water levels, and other pertinent information. The boring logs are attached in Appendix I.

During advancement of the borings, groundwater was contacted in Borings B-2 and B-3 at approximate depths of 37 and 38 feet, respectively. The 1-week water level reading in the temporary piezometer set at boring location B-2 was 34.1 feet. The initial water level reading during drilling for boring B-4 was 33.0 feet. The water level in boring B-4 was 38.0 feet on April 8, 2005, approximately 6 weeks later. The water level in boring B-5 was 38.0 feet on April 12, 2005, four days after drilling was completed. It should be noted that water level determinations made in relatively impervious (clay) soils might not present a reliable indication of the actual water table. However, water level determinations made in relatively pervious (sand/silt) soils are considered an accurate indication of the water table at the time that those measurements are made. Fluctuations in the water table should be expected with changing seasons, annual differences, and nearby river levels.

LABORATORY TESTS

All of the soil samples were observed by a KTI geologist in order to verify the field classifications. Laboratory tests were performed on the recovered samples to determine the engineering characteristics and for additional verification of the field classifications in accordance with ASTM D 2487. The results of these tests, including, plasticity (Atterberg Limits), and grain size analyses (mechanical and hydrometer methods) are presented in Appendix II. A limited number of Atterberg

Limits and additional grain size analysis tests were performed due to the predominance of granular soils at the project site.

SITE CONDITIONS

The site is situated in the floodplain of the Kansas River, at the existing Turkey Creek Pumping Station, located at 2301 State Line Road, in Kansas City, Missouri.

PROJECT DESCRIPTION

We understand that the project involves the construction of a new rock box at the Turkey Creek Wastewater Treatment plant in Kansas City, Missouri. The rock box is anticipated to extend approximately 60 feet below the existing ground surface.

GEOLOGY/SUBSURFACE CONDITIONS

The site overburden consists of fill materials and alluvial (river deposited) soils; bedrock was not contacted during the exploration. Fill materials were identified from both borings, extending to depths of approximately 12 to 13 feet below existing grade. The fill from Boring B-5 is comprised of mostly low plasticity clay with varying proportions of silt and sand. Fill soils from Boring B-4 are predominantly silty fine sand and sandy silt, with traces of rock and/or concrete fragments. The Unified Soil Classification System classifies low plasticity clay as CL, silty sand as SM, and sandy silt as ML.

The alluvial soils are predominantly comprised of sand, with intervening layers of silt and clay. The following classifications are present: poorly graded sand (SP), silty sand (SM), poorly to well-graded sand (SW-SP), well graded sand with silt and gravel (SW-SM), and poorly graded sand with silt (SP-SM), low plasticity clay (CL), medium plasticity clay (CL/CH), high plasticity clay (CH), low plasticity silt (ML), clayey sand (SC), and silty clay (CL-ML). The silt and clay layers vary in thickness from

less than one foot to several feet thick. The Standard Penetration Tests (from Boring B-4) indicate that the relative density varies from medium dense to loose. The clays generally exhibit high moisture content and soft consistency.

Coarse-grained material (gravel, cobbles, and possibly some boulders) was encountered at a depth of 69 feet in Boring B-4, and at a depth of 75 feet in Boring B-5. Boring B-4 encountered auger refusal on a probable boulder at a depth of 69.3 feet. Boring B-5 was extended to a depth of 85 feet, the lower 3 feet of which is comprised of poorly to well-graded gravel with sand, silt, and cobbles. Some boulders may also be present within this horizon. Bedrock materials were not contacted during the exploration. A subsurface summary of the boring logs is attached as Table 1.

DESIGN CRITERIA AND RECOMMENDATIONS

Laboratory test results of the recovered samples showed the various characteristics that were used as criteria for assisting in determining the recommendations for bearing values and design data. Please see Appendix II for grain size analysis results. Laboratory tests for salinity content of the groundwater were also run from boring B-4.

Seismic Considerations

Based on the International Building Code (IBC) Section 1615.1.1, the subsurface stratigraphy, and the use of a deep foundation system, the Site Class Definition for the project area is Site Class D. Due to the presence of loose sands, it is recommended that the design engineer conduct a liquefaction analysis. These recommendations are based on local geology and previous experience near the project area.

Site Preparation and Engineered Fill

Areas to receive fill should be stripped of vegetation, topsoil, pavement, and any other deleterious materials. Supplemental engineered fill should be placed in uniform horizontal lifts, with loose

thicknesses not exceeding eight inches. The thickness may need to be reduced depending on material types, method of compaction and type of equipment used. The geotechnical engineer should approve any off-site material proposed for use as fill. Engineered fill should be compacted to a minimum of 95 percent of maximum density at a moisture content between 0 and 4 percent above optimum moisture (preferred average of plus 2 percent).

The fill should be benched in any sloped areas greater than one vertical to five horizontal in order to maintain relatively horizontal lifts. The benching should be placed at not less than 12-inch rises over those areas where it is required as the work is brought up in layers. Fill should not be placed on soft materials or frozen ground. The compaction of fill should be monitored and tested by a representative of KTI.

Lateral Earth Pressure

The following K values may be used for the determination of lateral soil resistance for retaining structures or buried walls.

Material Type	Estimated ϕ	K_a	K_p	K_o	Average Wet Density, γ (lb/ft^3)
Site Sandy Soil	32	0.31	3.25	0.47	120
Granular Backfill	35	0.30	3.33	0.43	130

Groundwater Conditions

During advancement of the borings, groundwater was encountered in most of the test holes, as noted on the boring logs. The attached Table 1 summarizes the conditions at each boring location. At the time of drilling, groundwater was present in all borings (except B-1) at depths ranging from 33 to 38 feet below the existing ground surface. Subsequent groundwater level readings indicated

groundwater depths ranging from 34 feet to 38 feet below the existing ground surface. This data indicates static groundwater levels at these depths. However, at this time KTI, has not received ground elevations at the borings to develop actual elevations.

Temperature readings were taken of the groundwater with a GEOKON vibrating wire thermocouple device which was provided by CDM. These temperature readings were performed at levels 5 feet below the existing groundwater table, 5 feet above the bottom of the borehole, and in the center of this interval. The thermocouple was allowed to stabilize at each depth for two hours. Temperatures varied between 16.2 and 16.4 degrees Celcius at the tested depth intervals. For specific readings, please see the attached Tables 2 and 3.

Water samples were obtained with a bailer for borings B-4 and B-5 on April 8th and April 11th, respectively. The water samples were tested for salinity. Sodium content ranged from 33.9 to 53.9 mg/L(ppm) for the samples. The test results are attached in Appendix II.

It should be noted that water level determinations made in relatively impervious (clay) soils might not present a reliable indication of the actual water table. However, water level determinations made in relatively pervious (sand/silt) soils are considered an accurate indication of the water table at the time that those measurements are made. Fluctuations in the water table should be expected with changing seasons and annual differences.

PROPOSED FOUNDATION SYSTEMS

KTI investigated the use of several different deep foundation support systems, including mats, driven piles, and friction piles. Performance, constructability, and economics criteria should determine which option is selected. It appears that a mat foundation (of appropriate dimensions) may be the

most appropriate foundation type. However, we have also provided recommendations for alternate foundation support systems.

Deep Mat Foundations

It is anticipated that a mat foundation for the rock box would be embedded approximately 60 feet below the existing grade. Based on the ground conditions identified by the borings, the rock box foundation may be designed using a net allowable bearing capacity of 5,000 pounds per square foot (psf). The bearing capacity value considers a factor of safety of three against actual shear failure. Total settlement associated with this bearing value should be less than 1 inch. The foundation designer should also take into account the uplift force from groundwater when designing the foundation system.

Deep Pile Foundations

One option for support of the rock box is friction-type piles, such as auger pressure grouted (APG) piles. Difficulties may occur during advancement of piles to acceptable tip elevations within any cobble zones, such as those encountered beneath 70 to 75 feet below the existing grade. Because the use of piles require specialized installation procedures, these operations require a specific type of experience, and construction should be done by a specialty contractor who develops, designs, and warrants these proprietary types of deep foundations.

Installation lengths approaching 30 feet are anticipated to develop adequate capacity for these types of “friction” piles. Design capacities of 40-50 tons may be achieved. For end-bearing piles, rock is anticipated to occur at 115-120 feet below existing grade (55 to 60 feet below the bottom of the rock box).

With regard to any driven pile options, the installing contractor should perform and provide wave equation analysis for the intended installation equipment. The contractor's calculations should substantiate that the selected equipment and materials should be capable of developing design capacities at the given elevations.

Regardless of the pile type selected, pile load tests must be conducted to verify actual compressive capacities for production piling. At least two load tests should be performed, with a test being conducted at each basin location. The load tests should be conducted in a manner that reflects the fact that the top of piles may be 60 feet below grade. All deep foundation installation should be inspected by representatives of KTI.

Excavation Considerations

Most of the site soils are classified as Type C under OSHA standards, Excavation Standard Handbook 29 CFR Parts 1926.650 through 1926.652. Type C soils include any fill soils, cohesive soils with unconfined compressive strengths less than 0.5 tons per square foot, granular soils, or any soil below the water table. Temporary excavation slopes for Type C soils can be one and one-half horizontal to one vertical with a maximum depth of 20 feet.

The presence of a shallow groundwater condition will necessitate some type of dewatering system for excavations. The type of dewatering system, such as a deep well, well points, or sump pumps, will depend on the type of retaining system selected and the excavation process.

Excavations which are deeper than 20 feet require the preparation of an excavation design prepared by a registered professional engineer. Internally- braced excavations or tied back walls could be used during excavation. The use of these types of systems should consider all lateral loads resulting from retained soil, water or construction surcharge loads.

REMARKS

It is recommended that the geotechnical engineer be retained to review the plans and specifications for the project so that an evaluation and comments can be provided regarding the proper incorporation of information from this geotechnical report into the final construction documents. We further recommend that the geotechnical engineer be retained during construction phases for earthwork and foundations to provide observation and testing to aid in determining that design intent has been accomplished.

The findings in this report are based on data acquired to date and are assumed to be representative of conditions at locations between borings. Due to the fact that the area at the borings is very small relative to the overall site, and for other reasons, we make no statement warranting the conditions below our borings or at other locations throughout the site. In addition, we do not warrant that the general strata logged at the borings are necessarily typical of the remaining areas of the site.

Reports shall not be reproduced except in full, without written approval of KTI. Information in this report applies only to the referenced project in its present configuration and location and shall not be used for any other project or location.

BORING LOCATION SKETCH

TABLES

Table 1. Subsurface Summary

Boring No.	Boring Depth (ft)	Depth of Fill (ft)	Approximate Depth to Water (ft)	Remarks
B-1	20.0	1.0	—	
B-2	73.7	13.5	37.0	Sampler refusal on probable boulder at 73.7 feet.
B-3	95.0	18.5	38.0	
B-4	69.3	13.0	33.0	Sampler refusal on probable boulder at 69.3 feet.
B-5	85.0		38.0	

Table 2: Boring B-4 Temperature Readings (Degrees Celcius)

Depth (ft)	April 8, 2005 sampling time	Setting on GeoKon					
		A	B	C	D	E	F
43	9:55 a.m.	16.4	16.4	16.4	16.4	16.4	16.4
	11:55 a.m.	16.3	16.3	16.3	16.3	16.3	16.3
52	12:00 p.m.	16.3	16.3	16.3	16.3	16.3	16.3
	2:00 p.m.	16.2	16.2	16.2	16.2	16.2	16.2
61	2:00 p.m.	16.2	16.2	16.2	16.2	16.2	16.2
	4:00 p.m.	16.2	16.2	16.2	16.2	16.2	16.2

Table 3: Boring B-5 Temperature Readings (Degrees Celcius)

Depth (ft)	April 12, 2005 sampling time	Setting on GeoKon					
		A	B	C	D	E	F
43	9:00 a.m.	16.3	16.3	16.3	16.3	16.3	16.3
	11:00 a.m.	16.4	16.4	16.4	16.4	16.4	16.4
58	11:00 a.m.	16.4	16.4	16.4	16.4	16.4	16.4
	1:00 p.m.	16.4	16.4	16.4	16.4	16.4	16.4
79	1:00 p.m.	16.2	16.2	16.2	16.2	16.2	16.2
	3:00 p.m.	16.2	16.2	16.2	16.2	16.2	16.2

APPENDIX I

Boring Logs

APPENDIX II

Laboratory Test Results

SUMMARY OF LABORATORY RESULTS

Boring	Depth (Ft)	Sample No./Type	Natural Moisture %	Natural Dry Density (pcf)	Unconfined Compressive Strength (psf)	Atterberg Limits		Swell/Consolidation		Soil Type
						Liquid Limit %	Plasticity Index %	Swell Pressure (psf)	Volume Change %	
4	1.0-2.5	1, SS	17.1							
4	3.5-5.0	2, SS								
4	6.0-7.5	3, SS	16.5							
4	8.5-9.5	4, SS								
4	11.0-12.5	5, SS	25.1							
4	13.5-15.0	6, SS								
4	16.0-17.5	7. SS								
4	18.5-20.0	8, SS								
4	21.0-22.5	9, SS								
4	23.5-25.0	10, SS								
4	26.0-27.5	11, SS								
4	28.5-30.0	12, SS								
4	31.0-32.5	13, SS								
4	33.5-35.0	14, SS								
4	36.0-37.5	15, SS								
4	38.5-40.0	16, SS								
4	41.0-42.5	17, SS								
4	43.5-45.0	18, SS								
4	46.0-47.5	19, SS								
4	48.5-50.0	20, SS								
4	51.0-52.5	21, SS								
4	53.5-55.0	22, SS								
4	56.0-57.5	23, SS								
4	58.5-60.0	24, SS								
4	61.0-62.5	25, SS								
4	63.5-65.0	26, SS								

Boring	Depth (Ft)	Sample No./Type	Natural Moisture %	Natural Dry Density (pcf)	Unconfined Compressive Strength (psf)	Atterberg Limits		Swell/Consolidation		Soil Type
						Liquid Limit %	Plasticity Index %	Swell Pressure (psf)	Volume Change %	
4	66.0-67.5	27, SS								
4	68.5-69.3	28, SS								
5	0-5.0	1, CONT.								
5	5.0-15.0	2, CONT.								
5	15.0-25.0	3, CONT.								
5	25.0-35.0	4, CONT.								
5	35.0-45.0	5, CONT.								
5	45.0-55.0	6, CONT.								
5	55.0-65.0	7, CONT.								
5	65.0-75.0	8, CONT.								
5	75.0-85.0	9, CONT.								

GLOSSARY OF GEOTECHNICAL TERMS

ALLUVIUM	Sediments deposited by streams, including riverbeds and floodplains.
ARGILLACEOUS	Rocks composed of or having a notable portion of fine silt and/or clay in their composition.
ATTERBERG LIMITS	Water contents, in percentage of dry weight of soil, that correspond to the boundaries between the states of consistency, i.e. the boundary between the liquid and plastic states (liquid limit) and the boundary between the plastic and solid states (plastic limit).
BEDROCK-IN-PLACE	Continuous rock mass which essentially has not moved from its original depositional position.
CALCAREOUS	Containing calcium carbonate determined by effervescence when tested with dilute hydrochloric acid.
COLLUVIAL	Rock debris of various sizes loose from in-place bedrock mass, often shifted down gradient in conjunction with soil.
CROSS-BEDDING	Stratification which is inclined to the original horizontal surface upon which the sediment accumulated.
FISSILE BEDDING	Term applied to bedding which consists of laminae less than 2 millimeters in thickness.
FORMATION	A distinctive body of rock that serves as a convenient unit for study and mapping.
FOSSIL DETRITUS	The accumulation of broken, fragmented fossil debris.
FOSSILIFEROUS	Containing organic remains.
GLACIAL ERRATIC	A transported rock fragment different from the bedrock on which it lies, either free or as part of a sediment.
GLACIAL TILL	Nonsorted, nonstratified sediment carried or deposited by a glacier.
GLACIOFLUVIAL	Primarily deposited by streams from glaciers.
GROUP	A lithostratigraphic unit consisting of two or more formations.
JOINT	A fracture in a rock along which no appreciable displacement has occurred.
LIMESTONE	A sedimentary rock composed mostly of calcium carbonate ($CaCO_3$).

LOESS	A homogenous, nonstratified, unindurated deposit consisting predominantly of silt, with subordinate amounts of very fine sand and/or clay.
MICA	A mineral group, consisting of phyllosilicates, with sheetlike structures.
MEMBER	A specially developed part of a varied formation is called a member, if it has considerable geographic extent.
NODULE	A small, irregular, knobby, or rounded rock that is generally harder than the surrounding rock.
PERMEABILITY	The capacity of a material to transmit a fluid.
PETROLIFEROUS	Containing or yielding petroleum.
RECOVERY	The percentage of bedrock core recovered from a core run length.
RELIEF	The difference in elevation between the high and low points of a land surface.
RESIDUAL SOIL	Soil formed in place by the disintegration and decomposition of rocks and the consequent weathering of the mineral materials.
ROCK QUALITY DESIGNATION (RQD)	Refers to percentage of core sample recovered in unbroken lengths of 4 inches or more.
SANDSTONE	Sedimentary rock composed mostly of sand sized particles, usually cemented by calcite, silica, or iron oxide.
SERIES	A time-stratigraphic unit ranked next below a system.
SHALE	A fine-grained sedimentary rock composed primarily of clay, but often containing lesser amounts of silt and/or sand.
STRATIGRAPHY	Branch of geology that treats the formation, compositions, sequence, and correlation of the stratified rocks as parts of the earth's crust.
SYSTEM	Designates rocks formed during a fundamental chronological unit, a period.
UNCONFORMITY	A surface of erosion or nondeposition, usually the former, which separates younger strata from older rocks.
WEATHERING	The physical and chemical disintegration and decomposition of rocks and minerals.

General Notes

Laboratory Test Symbols	
Symbol	**Definition**
LL	Liquid Limit (ASTM D4318)
PL	Plastic Limit (ASTM D4318)
PI	Plasticity Index (LL minus PL)
Qu	Unconfined Compressive Strength, Pounds per Square Foot (psf)
Qp	Pocket Penetrometer Reading, Tons per Square Foot (TSF)
RQD	Rock Quality Designation % (Sum of rock core pieces >4 inches/length of core run)

Common Soil Classification Symbols

Clay	
Symbol	**Soil Type**
CL	Low plasticity clay
CL-ML	Low plasticity clay and silt
CL/CH	Medium plasticity clay
CH	High plasticity clay

Silt	
Symbol	**Soil Type**
ML	Low plasticity silt
MH	High plasticity silt

Sand	
Symbol	**Soil Type**
SW	Well graded sand
SP	Poorly graded sand
SM	Silty sand
SC	Clayey sand

Gravel	
Symbol	**Soil Type**
GW	Well graded gravel
GP	Poorly graded gravel
GM	Silty gravel
GC	Clayey gravel

Descriptive Terminology

Cohesionless Soils

Relative Density Term	"N" Value
Very Loose	0 - 4
Loose	5 - 9
Medium Dense	10 - 29
Dense	30 – 49
Very Dense	50 or more

Cohesive Soils

Consistency Term	"N" Value
Very soft	0 – 2
Soft	3 – 4
Medium	5 – 8
Stiff	9 – 15
Very Stiff	16 - 30
Hard	> 30

Relative Proportions and Sizes

Term	Range
Trace	< 5%
A Little	5 – 15%
Some	15 – 30%
With	30 – 50%

Material	Size
Boulder	> 12"
Cobble	3" – 12"
Gravel	4.75 - 76.2 mm
Sand	0.075 – 4.75 mm
Silt and Clay	< 0.075 mm