DETAILED SPECIFICATIONS
AND
CONTRACT DOCUMENTS

CITY OF BENTONVILLE, ARKANSAS

BENTONVILLE WATER RESOURCE RECOVERY FACILITY IMPROVEMENTS

VOLUME I

HWEI PROJECT NO. 2018143

MARCH 2025

BID SET

PREPARED BY

HAWKINS WEIR ENGINEERS, INC.

Van Buren (479) 474-1227 | Fort Smith (479) 242-4685 | Fayetteville (479) 455-2206 | Little Rock (501) 374-4846

www.hawkins-weir.com

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SECTION 00007

SEALS

The professional license seals listed on this page represent design responsibility for the Technical Specifications presented in this project. The initials of the professional responsible for each specification are listed in the specification Table of Contents.

Joshua S. Durham, P.E.
Hawkins-Weir Engineers, Inc.
Arkansas License No. 15397

Certification of Authorization
Hawkins-Weir Engineers, Inc.
COA No. 101

Larry Ellis Yancey, P.E.
Hawkins-Weir Engineers, Inc.
Arkansas License No. 12185

L Scott McBrayer, P.E.
Hawkins-Weir Engineers, Inc.
Arkansas License No. 9686

Larry C. Hardin, P.E.
Hawkins-Weir Engineers, Inc.
Arkansas License No. 13205

Blake A Peacock, P.E.
Hawkins-Weir Engineers, Inc.
Arkansas License No. 17180

Wesley Jay LeMonier, P.E.
Hawkins-Weir Engineers, Inc.
Arkansas License No. 20398

Margaret E. Kelch, P.E
Hawkins-Weir Engineers, Inc.
Arkansas License No. 20485

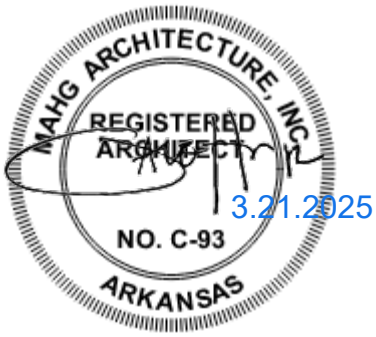
Amanda K. Johnson, P.E.
Black & Veatch, Inc.
Arkansas License No. 22360

Certification of Authorization
Black & Veatch Corp.
COA No. 381

Erin R. Briggeman, P.E.
Black & Veatch, Inc.
Arkansas License No. 22387

Michele Francom Roth, P.E.
Black & Veatch, Inc.
Arkansas License No. 17959

Lori R. Overhaug, P.E.
Black & Veatch, Inc.
Arkansas License No. 22299



MAHG Architecture, Inc.
Architectural Firm
Arkansas License No. C93

END OF SECTION

TABLE OF CONTENTS

CITY OF BENTONVILLE, ARKANSAS
BENTONVILLE WATER RESOURCE RECOVERY FACILITY IMPROVEMENTS
HWEI PROJECT NO. 2021037

VOLUME I

END VOLUME I

VOLUME II

END VOLUME II

VOLUME III

END OF VOLUME III

END OF SECTION

SECTION 00801

WAGE RATES

PART 1 GENERAL

1.01 SCOPE

A. This project is subject to the Davis-Bacon Act (40 U.S.C. §3141 et seq.) prevailing wage requirements and rates established set by the Secretary of Labor.

B. The Contractor shall be responsible for the compliance with the Davis-Bacon Act prevailing wage requirements including all subcontractors utilized by the Contractor.

1.02 RATES

A. Minimum wage rates as determined by the Davis-Bacon Act prevailing wage requirements are attached in this Section 00801.

B. Any wage classifications that are required, but not listed in the wage rate decision attached, must be requested in writing from the United States Department of Labor.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

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"General Decision Number: AR20250049 01/03/2025

Superseded General Decision Number: AR20240049

State: Arkansas

Construction Type: Heavy
HEAVY CONSTRUCTION PROJECTS (Including Water and Sewer Lines)

County: Benton County in Arkansas.

Note: Contracts subject to the Davis-Bacon Act are generally required to pay at least the applicable minimum wage rate required under Executive Order 14026 or Executive Order 13658. Please note that these Executive Orders apply to covered contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but do not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(1).

If the contract is entered into on or after January 30, 2022, or the contract is renewed or extended (e.g., an option is exercised) on or after January 30, 2022:	. Executive Order 14026 generally applies to the contract. . The contractor must pay all covered workers at least $17.75 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in 2025.
If the contract was awarded on or between January 1, 2015 and January 29, 2022, and the contract is not renewed or extended on or after January 30, 2022:	. Executive Order 13658 generally applies to the contract. . The contractor must pay all covered workers at least $13.30 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on that contract in 2025.

The applicable Executive Order minimum wage rate will be adjusted annually. If this contract is covered by one of the Executive Orders and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must still submit a conformance request.

Additional information on contractor requirements and worker protections under the Executive Orders is available at http://www.dol.gov/whd/govcontracts.

Modification Number	Publication Date
0	01/03/2025

SUAR2015-046 01/09/2017

	Rates	Fringes
CARPENTER, Includes Form Work	$ 17.50 **	0.00
CEMENT MASON/CONCRETE FINISHER	$ 17.72 **	0.00
ELECTRICIAN	$ 22.88	7.19
LABORER: Common or General	$ 13.12 **	0.63
LABORER: Pipelayer	$ 14.14 **	0.00
OPERATOR: Backhoe/Excavator/Trackhoe	$ 17.07 **	1.47
OPERATOR: Bulldozer	$ 17.00 **	1.92
OPERATOR: Crane	$ 24.21	6.79
OPERATOR: Loader	$ 15.45 **	0.00
PAINTER (Brush and Roller)	$ 18.00	0.00
TRUCK DRIVER: Dump Truck	$ 14.02 **	2.18

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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** Workers in this classification may be entitled to a higher minimum wage under Executive Order 14026 ($17.75) or 13658 ($13.30). Please see the Note at the top of the wage determination for more information. Please also note that the minimum wage requirements of Executive Order 14026 are not currently being enforced as to any contract or subcontract to which the states of Texas, Louisiana, or Mississippi, including their agencies, are a party.

Note: Executive Order (EO) 13706, Establishing Paid Sick Leave for Federal Contractors applies to all contracts subject to the Davis-Bacon Act for which the contract is awarded (and any solicitation was issued) on or after January 1, 2017. If this contract is covered by the EO, the contractor must provide employees with 1 hour of paid sick leave for every 30 hours they work, up to 56 hours of paid sick leave each year. Employees must be permitted to use paid sick leave for their own illness, injury or other health-related needs, including preventive care; to assist a family member (or person who is like family to the employee) who is ill, injured, or has other health-related needs, including preventive care; or for reasons resulting from, or to assist a family member (or person who is like family to the employee) who is a victim of, domestic violence, sexual assault, or stalking. Additional information on contractor requirements and worker protections under the EO is available at https://www.dol.gov/agencies/whd/government-contracts.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (iii)).

The body of each wage determination lists the classifications and wage rates that have been found to be prevailing for the type(s) of construction and geographic area covered by the wage determination. The classifications are listed in alphabetical order under rate identifiers indicating whether the particular rate is a union rate (current union negotiated rate), a survey rate, a weighted union average rate, a state adopted rate, or a supplemental classification rate.

Union Rate Identifiers

A four-letter identifier beginning with characters other than ""SU"", ""UAVG"", ?SA?, or ?SC? denotes that a union rate was prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2024. PLUM is an identifier of the union whose collectively bargained rate prevailed in the survey for this classification, which in this example would be Plumbers. 0198 indicates the local union number or district council number where applicable, i.e., Plumbers Local 0198. The next number, 005 in the example, is an internal number used in processing the wage determination. The date, 07/01/2024 in the example, is the effective date of the most current negotiated rate.

Union prevailing wage rates are updated to reflect all changes over time that are reported to WHD in the rates in the collective bargaining agreement (CBA) governing the classification.

Union Average Rate Identifiers

The UAVG identifier indicates that no single rate prevailed for those classifications, but that 100% of the data reported for the classifications reflected union rates. EXAMPLE: UAVG-OH-0010 01/01/2024. UAVG indicates that the rate is a weighted union average rate. OH indicates the State of Ohio. The next number, 0010 in the example, is an internal number used in producing the wage determination. The date, 01/01/2024 in the example, indicates the date the wage determination was updated to reflect the most current union average rate.

A UAVG rate will be updated once a year, usually in January, to reflect a weighted average of the current rates in the collective bargaining agreements on which the rate is based.

Survey Rate Identifiers

The ""SU"" identifier indicates that either a single non-union rate prevailed (as defined in 29 CFR 1.2) for this classification in the survey or that the rate was derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As a weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SUFL2022-007 6/27/2024. SU indicates the rate is a single non-union prevailing rate or a weighted average of survey data for that classification. FL indicates the State of Florida. 2022 is the year of the survey on which these classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 6/27/2024 in the example, indicates the survey completion date for the classifications and rates under that identifier.

?SU? wage rates typically remain in effect until a new survey is conducted. However, the Wage and Hour Division (WHD) has the discretion to update such rates under 29 CFR 1.6(c)(1).

State Adopted Rate Identifiers

The ""SA"" identifier indicates that the classifications and prevailing wage rates set by a state (or local) government were adopted under 29 C.F.R 1.3(g)-(h). Example: SAME2023-007 01/03/2024. SA reflects that the rates are state adopted. ME refers to the State of Maine. 2023 is the year during which the state completed the survey on which the listed classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 01/03/2024 in the example, reflects the date on which the classifications and rates under the ?SA? identifier took effect under state law in the state from which the rates were adopted.

WAGE DETERMINATION APPEALS PROCESS

1) Has there been an initial decision in the matter? This can be:

a) a survey underlying a wage determination
b) an existing published wage determination
c) an initial WHD letter setting forth a position on a wage determination matter
d) an initial conformance (additional classification and rate) determination

On survey related matters, initial contact, including requests for summaries of surveys, should be directed to the WHD Branch of Wage Surveys. Requests can be submitted via email to davisbaconinfo@dol.gov or by mail to:

Branch of Wage Surveys
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

Regarding any other wage determination matter such as conformance decisions, requests for initial decisions should be directed to the WHD Branch of Construction Wage Determinations. Requests can be submitted via email to BCWD-Office@dol.gov or by mail to:

Branch of Construction Wage Determinations
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

2) If an initial decision has been issued, then any interested party (those affected by the action) that disagrees with the decision can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Requests for review and reconsideration can be submitted via email to dba.reconsideration@dol.gov or by mail to:

Wage and Hour Administrator
U.S. Department of Labor

200 Constitution Avenue, N.W.
Washington, DC 20210

The request should be accompanied by a full statement of the interested party's position and any information (wage payment data, project description, area practice material, etc.) that the requestor considers relevant to the issue.

3) If the decision of the Administrator is not favorable, an interested party may appeal directly to the Administrative Review Board (formerly the Wage Appeals Board). Write to:

Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210.

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END OF GENERAL DECISION"

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"General Decision Number: AR20250023 01/03/2025

Superseded General Decision Number: AR20240023

State: Arkansas

Construction Type: Building
BUILDING CONSTRUCTION PROJECTS (does not include single family homes or apartments up to and including 4 stories).

County: Benton County in Arkansas.

Note: Contracts subject to the Davis-Bacon Act are generally required to pay at least the applicable minimum wage rate required under Executive Order 14026 or Executive Order 13658. Please note that these Executive Orders apply to covered contracts entered into by the federal government that are subject to the Davis-Bacon Act itself, but do not apply to contracts subject only to the Davis-Bacon Related Acts, including those set forth at 29 CFR 5.1(a)(1).

If the contract is entered into on or after January 30, 2022, or the contract is renewed or extended (e.g., an option is exercised) on or after January 30, 2022:	. Executive Order 14026 generally applies to the contract. . The contractor must pay all covered workers at least $17.75 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on the contract in 2025.
If the contract was awarded on or between January 1, 2015 and January 29, 2022, and the contract is not renewed or extended on or after January 30, 2022:	. Executive Order 13658 generally applies to the contract. . The contractor must pay all covered workers at least $13.30 per hour (or the applicable wage rate listed on this wage determination, if it is higher) for all hours spent performing on that contract in 2025.

The applicable Executive Order minimum wage rate will be adjusted annually. If this contract is covered by one of the Executive Orders and a classification considered necessary for performance of work on the contract does not appear on this wage determination, the contractor must still submit a conformance request.

Additional information on contractor requirements and worker protections under the Executive Orders is available at http://www.dol.gov/whd/govcontracts.

Modification Number	Publication Date
0	01/03/2025

BOIL0069-002 01/01/2021

	Rates	Fringes
BOILERMAKER	$ 30.49	23.13

PAIN0424-008 07/01/2021

	Rates	Fringes
PAINTER (Spray)	$ 16.25 **	10.42

PLUM0155-015 08/01/2024

	Rates	Fringes
PIPEFITTER	$ 33.08	13.56

SUAR2015-020 01/09/2017

	Rates	Fringes
BRICKLAYER	$ 19.39	0.00
CARPENTER, Includes Drywall Hanging, and Form Work	$ 16.04 **	2.43
CEMENT MASON/CONCRETE FINISHER	$ 17.67 **	0.00
ELECTRICIAN	$ 24.32	5.96
HVAC MECHANIC: HVAC DUCT INSTALLATION	$ 20.96	2.72
INSULATOR - MECHANICAL (Duct, Pipe & Mechanical System Insulation)	$ 17.16 **	4.76
IRONWORKER, REINFORCING	$ 14.00 **	0.00
IRONWORKER, STRUCTURAL	$ 19.39	0.00
LABORER: Common or General	$ 13.87 **	0.00
LABORER: Mason Tender - Brick	$ 12.04 **	0.00
LABORER: Pipelayer	$ 14.02 **	0.00
OPERATOR: Backhoe/Excavator/Trackhoe	$ 15.89 **	0.00
OPERATOR: Bulldozer	$ 16.74 **	0.00
OPERATOR: Crane	$ 17.52 **	0.00
OPERATOR: Grader/Blade	$ 14.66 **	0.00
OPERATOR: Paver (Asphalt, Aggregate, and Concrete)	$ 17.79	0.00
OPERATOR: Roller	$ 15.60 **	2.15
PAINTER (Brush and Roller)	$ 13.38 **	0.00
PLUMBER	$ 22.32	3.41

ROOFER.....$ 15.39 ** 0.00

TRUCK DRIVER: Dump Truck.....$ 13.92 ** 0.85

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Administrative Review Board
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210.

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END OF GENERAL DECISION"

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DBE/MBE/WBE COMPLIANCE EVALUATION FORM
SUPPLEMENTAL CONDITIONS OF THE REVOLVING LOAN FUND
(Bid Package Documentation)

Bidders are to complete this form and submit within fifteen days after the bid opening. A condition for remaining in competition for award is the satisfactory completion of this form. The undersigned submits the following data with respect to the firm's efforts to meet the Arkansas Natural Resources Commission's goal for DBE/MBE/WBE participation. If you have any questions, please contact the Owner/Borrower/Owner's consultant engineer.

Prime Contractors that are DBE firms are not exempt from conducting the "good faith efforts" as described in 40 CFR Part 33, Subpart C- Good Faith Efforts.

Subcontracting is to be defined as subcontracts for construction, supplies, equipment and services. It is very infrequent that a Prime Contractor can do the job without hiring for construction, equipment, supplies, and services. If Prime Contractor does not sub-contract/procure for any of the categories mentioned above, the Prime Contractor must indicate that on this form.

1. Name of Project: _____ Project No: _____

2. Name of General Contractor: _____

3. DBE/MBE/WBE Firm: _____
(Name) (Complete a separate form for each DBE/MBE/WBE to be used as a subcontractor)

_____
(Address) (City, State, Zip Code)

_____
(Phone Number) (Fax Number)

4. Describe Work to be performed by the DBE/MBE/WBE, provide dollar amount of the subcontract.

_____

_____

_____

DOCUMENTATION OF AFFIRMATIVE STEPS TAKEN TO OBTAIN DBE/MBE/WBE PARTICIPATION

5. Documentation that DBE/MBE/WBE quotes were solicited through direct communication and documentation of responses received (Direct communication includes: faxes, phone calls, letters, e-mails). Newspaper ads/public notice ads alone will not be considered sufficient to meet the good faith effort requirements. The omission of a newspaper advertisement/public notice is not grounds for the bid to be rejected as well.

_____

_____

6. What sources were used to identify potential DBE/MBE/WBE firms. (Arkansas Highway and Transportation Department; Arkansas Economic Development Commission's Minority Business Development Division; U.S. Small Business Administration; other sources, please specify and provide documentation). The Commission recommends using the sources above.

_____

_____

7. Describe steps taken to divide work items into small tasks in an effort to maximize DBE/MBE/WBE participation.

_____

_____

8. List reasons for rejecting a DBE/MBE/WBE that indicated a desire to participate and/or submitted bids.

_____

_____

The undersigned hereby certified, having provided responses or documentation to the questions in the foregoing affirmative steps taken to obtain DBE/MBE/WBE participation, that they are true and correct to the best of her/her knowledge, information and belief.

Name of General Contractor: _____

Signature: _____

Title/Date: _____

REVOLVING LOAN FUND (RLF)
SUPPLEMENTAL GENERAL CONDITIONS

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1. PROJECT FUNDING

These Supplemental General Conditions are based on detailed, specific guidance provided by the United States Environmental Protection Agency (US EPA).

In accordance with Title XV and XVI, the Arkansas Natural Resources Commission (Commission) and the Arkansas Development Finance Authority (ADFA) is not a partner, joint venture or in any way party to the construction contract. The Recipient and its Contractors shall release and hold harmless the officers and employees of the Commission and ADFA from claims arising in connection with the design, construction and operation of the project including any matter due solely to the Contractor or Borrowers negligence.

2. SUPERSESSION

These Supplemental General Conditions supersede any conflicting provisions of the Contract Documents.

3. DEFINITIONS

Wherever used in the Contract Documents, the following terms shall have the meanings indicated and shall be applicable to both the singular and plural thereof:

A. **Addenda** - Written or graphic instruments issued prior to the execution of the Agreement which modify or interpret the Contract Documents, Drawings and Specifications, by additions, deletions, clarifications, or corrections.

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

C. **Bidder** - Any person, firm or corporation submitting a Bid for the Work.

D. **Bonds** - Bid, Performance, and Payment Bonds and other instruments of surety, furnished by the Contractor and the Contractor's surety in accordance with the Contract Documents.

E. **Change Order** - A written order to the Contractor authorizing an addition, deletion, or revision in the Work within the general scope of the Contract Documents, or authorizing an adjustment in the Contract Price or Contract Time.

F. **Commission** – The Arkansas Natural Resources Commission.

G. **Contract Documents** - The contract, including Advertisement for Bids, Information for Bidders, Bid, Bid Bond, Agreement, Payment Bond, Performance Bond, Notice of Award, Notice to Proceed, Change Order, Drawings, Specifications, General Conditions, Supplemental General Conditions, and Addenda.

H. **Contract Price** - The total monies payable to the Contractor under the terms and conditions of the Contract Documents.

I. **Contract Time** - The number of calendar days stated in the Contract Documents for the completion of the Work.

J. **Contractor** - The person, firm or corporation with whom the Owner has executed the Agreement.

K. **Drawings** - The parts of the Contract Documents, which show the characteristics, and scope of the Work to be performed and which have been prepared or approved by the Engineer.

L. **Engineer** - The person, firm, or corporation named as such in the Contract Documents.

M. **Field Order** - A written order effecting a change in the Work not involving an adjustment in the Contract Price, an extension of the Contract Time, or a change affecting the overall integrity of the design of the project issued by the Engineer, not the Engineer's Resident Inspector, to the Contractor during construction.

N. **Notice of Award** - The written notice of the acceptance of the Bid from the Owner to the successful Bidder.

O. **Notice to Proceed** - Written communication issued by the Owner to the Contractor authorizing him/her to proceed with the Work and establishing the date for commencement of the Work.

P. **Owner** - A public or quasi-public body or authority, corporation, association, partnership, or an individual for whom the Work is to be performed.

Q. **Project** - The undertaking to be performed as provided in the Contract Documents.

R. **Resident Project Representative** - The authorized representative of the Owner who is assigned to the Project site or any part thereof.

S. **Shop Drawings** - All drawings, diagrams, illustrations, brochures, schedules and other data which are prepared by the Contractor, a Subcontractor, manufacturer, Supplier or distributor, which illustrates how specific portions of the Work shall be fabricated or installed.

T. **Specifications** - A part of the Contract Documents consisting of written descriptions of a technical nature of materials, equipment, construction systems, standards and workmanship.

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

V. **Substantial Completion** - That date certified by the Engineer when the construction of the Project or a specified part thereof is sufficiently completed, in accordance with the Contract Documents, so that the Project or specified part can be utilized for the purposes for which it is intended.

W. **Additional Supplemental General Conditions** - Modifications to Supplemental General Conditions required by a State agency for participation in the Project and approved by the agency in writing prior to inclusion in the Contract Documents, or such requirements that may be imposed by applicable state laws.

X. **Supplier** - Any person or organization who supplies materials or equipment for the Work, including that fabricated to a special design, but who does not perform labor at the site.

Y. **Work** - All labor necessary to produce the construction required by the Contract Documents, and ill materials and equipment incorporated or to be incorporated in the Project.

Z. **Written Notice** - Any notice to any party of the Agreement relative to any part of this Agreement in writing and considered delivered and the service thereof completed, when posted by certified or registered mail to the said party at their last given address, or delivered in person to said party or their authorized representative on the Work.

4. ADDITIONAL INSTRUCTIONS AND DETAIL DRAWINGS

A. The Contractor may be furnished additional instructions and detail drawings, by the Engineer, as necessary to carry out the Work required by the Contract Documents.

B. The additional drawings and instructions thus supplied will become a part of the Contract Documents. The Contractor shall carry out the Work in accordance with the additional detailed drawings and instructions.

5. DRAWINGS AND SPECIFICATIONS

A. The intent of the Drawings and Specifications is that the Contractor shall furnish all labor, materials, tools, equipment, and transportation necessary for the proper execution of the Work in accordance with the Contract Documents and all incidental work necessary to complete the Project in an acceptable manner, ready for use, occupancy or operation by the Owner.

B. In case of conflict between the Drawings and Specifications, the Specifications shall govern. Figure dimensions on Drawings shall govern over general Drawings.

C. Any discrepancies found between the Drawings and Specifications and site conditions or any inconsistencies or ambiguities in the Drawings or Specifications shall be immediately reported to the Engineer, in writing, who shall promptly correct such inconsistencies or ambiguities in writing. Work done by the Contractor after discovery of such discrepancies, inconsistencies or ambiguities shall be done at the Contractor's risk.

D. In the case of defective Specifications for which the Owner is responsible, the equitable adjustment shall include any increased cost the Contractor reasonably incurred in attempting to comply with those defective Specifications.

6. LAND AND RIGHTS-OF-WAY

A. Prior to issuance of Notice to Proceed, the Owner shall obtain all land and rights-of-way necessary for carrying out and for the completion of the Work to be performed pursuant to the Contract Documents, unless otherwise mutually agreed.

B. The Owner shall provide to the Contractor information which delineates and describes the lands owned and rights-of-way acquired.

C. The Contractor shall provide at its own expense and without liability to the Owner any additional land and access thereto that the Contractor may desire for temporary construction facilities, or for storage of materials.

7. BIDDING AND CONTRACT AWARD

A. Prospective Bidders are advised that other sections of these Supplemental General Conditions describe requirements pertaining to bidding and the performance of the RLF funded contract. The Supplemental General Conditions should be thoroughly reviewed by prospective Bidders prior to the preparation and submission of bids.

B. Awards shall be made only to the lowest responsive, responsible Contractors possessing the ability to perform successfully under the terms and conditions of the proposed procurement. Bidders are required to comply with the requirements of these Supplemental General Conditions in the preparation and submission of bids. Failure by the bidder to comply with the requirements outlined herein may result in the rejection of the bid as non-responsive.

C. Bidders shall submit with the bid proposal an executed Contractor's Act of Assurance form as provided in these contract documents. Through execution of this form, the Bidder warrants its understanding of and compliance with these Supplemental General Conditions and all relevant requirements pertaining to the RLF funded work. In addition, each prime Contractor is required to submit an executed Contractor's Act of Assurance form to the Owner for each subcontract awarded above $2,000.00.

D. The information described below shall be submitted to the Commission by the Owner for review and approval within thirty days of bid opening. Construction contracts will not be Awarded without Commission concurrence.
   i. Proposal of the lowest responsive responsible Bidder.
   ii. Bid tabulation showing all bids and bid opening date.
   iii. Recommendation of Award of contract by Engineer.
   iv. Clear Site Certificate without exceptions.
   v. Certified copies of the advertisements for bids.
   vi. Contractors Act of Assurance Form
   vii. Bid bond for and name of Surety Company that will underwrite the Payment and Performance Bonds for the lowest responsive responsible Bidder.
   viii. Itemized bid breakdown of lump sum bid from lowest responsive responsible Bidder (if applicable).
   ix. Resume(s) of the proposed resident inspector(s).
   x. DBE/MBE/WBE documentation from lowest responsive responsible Bidder within fifteen days of bid opening.

   Item (x.) shall be submitted by the lowest responsive responsible Bidder to the Owner within fifteen days of bid opening for transmittal to the Commission.

E. If the Owner has not already enacted a written protest procedure to handle and resolve disputes relating to the award of contracts, the Owner will follow the process below upon receipt of a bid protest:
   i. Bid protests may be filed by an "interested party." Prior to a bid submittal deadline, these persons include any party who declares an interest in the solicitation. Following the bid submittal deadline, interested parties include only bidders who submitted a bid or response to the solicitation.
   ii. The written protest shall specify the reasons and facts upon which the protest is based; specific portions of the documents or statutes that form the basis of the protest; and the name, address, and telephone number of the party representing the Bidder.

iii. The protest must be filed in writing with the Owner at the address below:

Attn: _____

_____

_____

_____ ,AR _____

iv. The protest must be filed with the Owner before 5 p.m. and no later than five business days after the date of the Bid opening.

v. Owner must disclose all bid protests to the Commission immediately.

vi. Owner will investigate the basis for the bid protest and analyze the facts. Owner will notify Bidder whose bid is the subject of the bid protest of evidence presented in the bid protest and evidence found as a result of the investigation, and, if deemed appropriate, afford Bidder an opportunity to rebut such evidence, and permit Bidder to present evidence that it should be allowed to perform the work. If deemed appropriate by Owner, an informal hearing will be held.

vii. Owner will issue a written decision within 15 days following receipt of the bid protest, unless factors beyond Owner's reasonable control prevent such a resolution, in which event such decision will be issued as expeditiously as circumstances reasonably permit. The decision will state the reasons for the action taken by Owner. A copy of the decision will be furnished to the protestor, the Commission, the Bidder whose bid is the subject of the bid protest, and all Bidders affected by the decision. A Bidder is affected by the decision on a bid protest if a decision on the protest could have resulted in the Bidder not being the lowest responsible and responsive Bidder for the contract.

8. AMERICAN IRON AND STEEL (AIS)

The Contractor acknowledges to and for the benefit of the Owner and the Commission that it understands the goods and services under this Agreement are being funded with monies made available by the Clean Water State Revolving Fund and/or Drinking Water State Revolving Fund that have statutory requirements commonly known as "American Iron and Steel;" that requires all of the iron and steel products used in the project to be produced in the United States including iron and steel products provided by the Contactor pursuant to this Agreement. The Contractor hereby represents and warrants to and for the benefit of the Owner and the Commission that (a) the Contractor has reviewed and understands the American Iron and Steel Requirement, (b) all of the iron and steel products used in the project will be and/or have been produced in the United States in a manner that complies with the American Iron and Steel Requirement, unless a waiver of the requirement is approved, and (c) the Contractor will provide any further verified information, certification or assurance of compliance with this paragraph, or information necessary to support a waiver of the American Iron and Steel Requirement, as may be requested by the Owner or the Commission. Notwithstanding any other provision of this Agreement, any failure to comply with this paragraph by the Contractor shall permit the Owner or Commission to recover as damages against the Contractor any loss, expense, or cost (including without

limitation attorney's fees) incurred by the Owner or Commission resulting from any such failure (including without limitation any impairment or loss of funding, whether in whole or in part, from the Commission or any damages owed to the Commission by the Owner). While the Contractor has no direct contractual privity with the Commission, as a lender to the Owner for the funding of its project, the Owner and the Contractor agree that the Commission is a third-party beneficiary and neither this paragraph (nor any other provision of this Agreement necessary to give this paragraph force or effect) shall be amended or waived without the prior written consent of the Commission. A copy of the EPA Memorandum implementing the American Iron and Steel requirement and its procedures is attached as Appendix D to these Supplemental General Conditions.

9. DISADVANTAGED, MINORITY, AND WOMEN'S BUSINESS ENTERPRISES

Whenever subcontracts are solicited, the Contractor is required to take affirmative steps (known as "good faith efforts") to assure that disadvantaged business enterprises (DBE), which includes small and minority and women's business enterprises (MBE/WBE) as well, are used when possible as sources of materials, supplies, equipment, construction activities and professional services. DBE utilization is authorized by 40 CFR Parts 30, 31, 33, 35, and 40, OMB Circular A-102, and Executive Orders 11625, 12432 and 12138.

The Contractor and Loan Recipient shall at a minimum, take the following affirmative actions, known as "good faith efforts" in the procurement of subcontracts for construction, equipment, services, and supplies:

i. Ensure DBE firms are made aware of contracting opportunities to the fullest extent practicable through outreach and recruitment activities and include small, minority and women's businesses on solicitation lists;
ii. Assure that small, minority and women's businesses are solicited whenever they are potential sources;
iii. Divide total requirements, when economically feasible, into small tasks or quantities to permit maximum participation by small, minority and women's businesses;
iv. Establish delivery schedules, when the requirements of the work permit, which will encourage participation by small, minority and women's businesses;
v. Use the services of the Small Business Administration and the Office of Minority Business Enterprise of the U.S. Department of Commerce, AHTD and AEDC as appropriate.
vi. Continue the above steps, including follow-up contact as necessary, throughout the performance of the contract.

Prime Contractors must also follow the steps indicated below in the paragraph entitled "DBE/MBE/WBE Requirements Prior to Award" and all other instructions of this document.

DBE/MBE/WBE Requirements Prior to Award: All Bidders, as a condition of bidding, are required to document to the Owner and to the Commission that the "good faith efforts" were taken in the preparation of bids to obtain DBE/MBE/WBE participation. Contractors,

including DBE Prime Contractors, must conduct the "six good faith efforts" as well. Steps for Compliance are as follows:

i. Solicit DBE/MBE/WBE quotes through direct solicitation communication, document that this was done, and submit within fifteen days of the bid opening. Examples of direct solicitation communication that must be conducted by the low bidder are: faxes, letters, phone calls, and emails. Indicate the source of the DBE/MBE/WBE list(s) used. Sources of DBE Certified Lists are listed below. Newspaper Advertisements/Public Notices alone will not meet the required DBE solicitation efforts.
ii. Document efforts and responses received.
iii. Document contracts awarded, or intent to award, and indicate whether the contract is with a DBE/MBE or WBE certified firm.
iv. Document the basis on which the subcontractor/supplier was selected and/or rejected for all contracts awarded.

Note: Subcontracts include: supplies, services, equipment, and construction activity.

If the Primary Contractor states that they can complete the entire project using only in-house services and supplies, then the Contractor must indicate they will not use a subcontractor or procure supplies, services, and equipment on the DBE Compliance Evaluation Form and shall write a letter to that effect to Commission. Note, this occurs very infrequently.

Required Form: The DBE Compliance Evaluation Form Supplemental Conditions of the Revolving Loan Fund. (This form is numbered RLF-96 for CWRLF projects.) This form is to be completed and submitted within fifteen days of the bid opening.

Lists of DBE/MBE/WBE firms are available from:

- Arkansas Highway and Transportation Department, Programs and Contracts Division; 10324 I-30; Post Office Box 2261; Little Rock, Arkansas 72203, Phone: (501) 569-2259 www.ahtd.state.ar.us/contract/program/letting
- Arkansas Economic Development Commission, Small and Minority Business Team; One Capitol Mall; Little Rock, Arkansas 72201; Phone: (501) 682-6105 http://www.arkansasedc.com.
- Arkansas Small Business Administration, Business Opportunity Section; 2120 Riverfront Drive, Suite 100; Little Rock, Arkansas 72202-1747; Phone: (501) 324-7379; http://pro-net.sba.gov/ or http://www.ccr.gov.

A copy of 40 CFR Part 33, Subpart C- Good Faith Efforts is attached to these Supplemental General Conditions.

DBE/MBE/WBE Reporting Requirements: In addition to the reporting and documentation requirements during bidding, the Contractor is required to report to the Owner within fifteen days of the end of each calendar quarter, or to the Division as requested, all contracts awarded to DBE/MBE/WBE firms throughout the life of the

contract. The Owner is required to report to the Division within thirty days of the end of each calendar quarter, all contracts awarded by the Owner and subcontracts awarded by the Owner's Contractors to DBE/MBE/WBE firms. In accordance with 40 CFR 35, Subpart K, the Division must report to the Environmental Protection Agency all DBE/MBE/WBE participation in the RLF program.

10. EQUAL EMPLOYMENT OPPORTUNITY CLAUSE

A. The Contractor will not discriminate against any employee or applicant for employment because of race, color, creed, sex, age, marital status, or national origin. The Contractor shall take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, creed, sex, age, marital status, or national origin. Such action shall include, but not be limited to the following: employment, upgrading, demotion or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to furnish and post in conspicuous places, available to employees and applicants for employment, notices setting forth the provisions of this equal employment opportunity clause.

B. The Contractor shall, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, creed, sex, age, marital status, or national origin.

C. In the event of the Contractor’s noncompliance with the equal employment opportunity clause of this contract or with any rules, regulations, or orders, this contract may be cancelled, terminated, or suspended in whole or in part.

D. The Contractor shall include the provisions of subparagraph's (A) through (C) in every subcontract or purchase order involved with this contract.

E. The Contractor or any Subcontractor shall have an affirmative action plan which declares that it does not discriminate on the basis of race, color, creed, national origin, sex, marital status, or age and which specifies goals and target dates to assure the implementation of that plan. The Owner shall establish procedures to assure compliance with this requirement by the Contractor and to assure that suspected or reported violations are promptly investigated.

F. The Contractor and Subcontractors supplying materials, equipment and/or labor must comply with the Civil Rights Act of 1964 as amended (42 U.S.C. 2000d et seq.), Section 504 of the Rehabilitation Act of 1973 as amended (29 U.S.C. 794), Section 13 of the Federal Water Pollution Control Act Amendments of 1972 regarding sex discrimination (Public Law 92-500), and the Age Discrimination Act of 1973.

The Contractor and all Subcontractors shall provide equal employment opportunity for all qualified applicants and all contractor solicitations for employees must contain the Equal Employment Opportunity statement. The Prime Contractor must assure Subcontractor compliance with the Civil Rights Act for each subcontract by including the Act of

Assurance form and these Supplemental General Conditions in each Subcontract in excess of $10,000. Applicable Equal Employment Opportunity regulations and Nondiscrimination provisions are described in the Appendix to these Supplemental General Conditions.

11. LABOR STANDARDS

The Contractor and all Subcontractors awarded subcontracts shall pay all laborers and mechanics employed on the project not less than the prevailing wage rates, as determined by the United States Secretary of Labor, in accordance with the Davis-Bacon Act as provided for in the Supplemental General Condition's Appendix A.

The wage decision identifies job classifications and minimum wages to be paid to all workers. Payrolls must be submitted weekly by the Contractor and all non-exempt Subcontractors to the Owner showing each worker's name, address, job classification, hourly rate of pay, daily regular and overtime hours, gross and net pay, and any fringe benefits where applicable. All workers are required to receive overtime pay in any week in which the hours worked exceed 40 hours per work week. Overtime is paid at a rate not less than 1 and 1/2 times the worker's base rate of pay.

The Owner is responsible for monitoring contractor compliance with Davis-Bacon Act requirements of Appendix A. The Owner's responsibilities will include, but not be limited to, payroll review for compliance, maintain payroll files, and conduct on-site interviews with the Contractor's employees to verify payroll accuracy. The Owner will provide the Commission a letter with each pay request certifying wages, through payroll review and employee interviews, met the Davis-Bacon Requirements of this contract. Copies of completed interviews will be forwarded to the Commission.

12. **RESPONSIBILITIES OF PARTICIPANTS REGARDING TRANSACTIONS**
(A.K.A. DEBARMENT AND SUSPENSION)

Individuals or organizations that have been debarred or excluded from participating in Federal Assistance programs under 40 CFR Part 32 are prohibited from participating in the RLF program. This prohibition applies for every contract and subcontract for materials, supplies, equipment, and services. Contractors and Subcontractors shall execute the Contractors Act of Assurance Form as provided in the Contract Documents certifying compliance with 40 CFR Part 32.

13. PROCUREMENT PROHIBITIONS

As required by Executive Order 11738, Section 306 of the Clean Air Act and Section 508 of the Clean Water Act, RLF loan recipients, Prime Contractors and Subcontractors are prohibited from procuring goods and services from persons who have been convicted of violations of either law if the goods or services are to be produced by the facility that gave rise to the violation.

14. SUBSTITUTIONS (of "or Equal")

All RLF procurement transactions shall be conducted in a manner that promotes maximum free and open competition. Whenever a material, article, or piece of equipment is identified

on the Drawings or Specifications by reference to brand name or catalogue numbers, it shall be understood that this is referenced for the purpose of defining the performance or other salient requirements and that other products of equal capacities, quality and function shall be considered for substitution. The Contractor may recommend the substitution of a material, article, or piece of equipment of equal substance and function for those referred to in the Contract Documents by reference to brand name or catalogue number, and if, in the opinion of the Engineer, such material, article or piece of equipment is of equal substance and function to that specified, the Engineer may approve its substitution and use by the Contractor. Any cost differential shall be deductible from the Contract Price and the Contract Documents shall be appropriately modified by Change Order. The Contractor warrants that if substitutes are approved, no major changes in the function or general design of the Project will result. Incidental changes or extra component parts required to accommodate the substitute will be made by the Contractor without a change in the Contract Price or Contract Time.

15. INSURANCE

A. The Contractor shall purchase and maintain such insurance as will protect it from claims set forth below which may arise out of, or result from, the Contractor's execution of the Work, whether such execution be by the Contractor, any Subcontractor, or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable:
   i. Claims under worker's compensation, disability benefit and other similar employee benefit acts;
   ii. Claims for damages because of bodily injury, occupational sickness or disease, or death of employees;
   iii. Claims for damages because of bodily injury, sickness or disease, or death of any person other than employees;
   iv. Claims for damages insured by usual personal injury liability coverage which are sustained (1) by any person as a result of an offense directly or indirectly related to the employment of such person by the Contractor, or (2) by any other person; and
   v. Claims for damages because of injury to or destruction of tangible property, including loss of use resulting therefrom.

B. Certificates of Insurance acceptable to the Owner and the Commission shall be filed with the Owner and the Commission prior to commencement of the Work. Each insurance policy shall contain a clause providing that it shall not be canceled by the insurance company without written notice to the Owner and the Commission of intention to cancel that is in accordance with Arkansas Code Annotated §23-66-206. These Certificates shall contain a provision that coverages afforded under the policies will not be cancelled unless at least fifteen days prior written notice has been given to the Owner and the Commission. The Insurance shall be made by an agent licensed by the Insurance Commissioner of the State of Arkansas to represent the surety company executing the bonds. Furthermore, the Commission will be a "Certificate Holder" and the words "will endeavor" must be removed from the insurance form.

C. The Contractor shall procure and maintain, at the Contractor's own expense, during the Contract Time, liability insurance as hereinafter specified:

Contractor's General Public Liability and Property Damage Insurance including vehicle coverage issued to the Contractor and protecting the Contractor from all claims for personal injury, including death, and all claims for destruction of or damage to property, arising out of or in connection with any operations under the Contract Documents, whether such operations be by the Contractor or by any Subcontractor employed by the Contractor or anyone directly or indirectly employed by the Contractor or by a Subcontractor employed by the Contractor. Insurance shall be written with a limit of liability of not less than $1,000,000 for all damages arising out of bodily injury, including death, at any time resulting therefrom sustained by any one person in any one accident; and a limit of liability of not less than $2,000,000 aggregate for any such damage sustained by two or more persons in any one accident. Insurance shall be written with a limit of liability of not less than $1,000,000 for all property damage sustained by any one person in any one accident; and a limit of liability of not less than $1,000,000 aggregate for any such damage sustained by two or more persons in any one accident.

D. The Contractor shall furnish umbrella liability coverage, and keep it in effect during the term of the contract which provides excess limits over the primary coverages. The minimal amount of coverage will be determined by the Risk Management Division of the Arkansas Insurance Department.

E. The Contractor shall procure and maintain, at the Contractor's own expense, during the Contract Time, in accordance with the provisions of the laws of the State in which the Work is performed, Worker's Compensation Insurance, including occupational disease provisions, for all of the Contractor's employees at the site of the Project and in case any Work is sublet, the Contractor shall require such Subcontractor similarly to provide Worker's Compensation Insurance, including occupational disease provisions for all of the latter's employees unless such employees are covered by the protection afforded by the Contractor. In case any class of employees engaged in hazardous work under this contract at the site of the Project is not protected under Worker's Compensation statute, the Contractor shall provide, and shall cause each Subcontractor to provide, adequate and suitable insurance for the protection of its employees not otherwise protected.

F. The Contractor shall secure, if applicable, "All Risk" type Builder's Risk Insurance for Work to be performed. Unless specifically authorized by the Owner, the amount of such insurance shall not be less than the Contract Price totaled in the Bid. The policy shall cover not less than the losses due to fire, explosion, hail, lightening, vandalism, malicious mischief, wind, collapse, riot, aircraft, and smoke during the Contract Time, and until the Work is accepted by the Owner. The policy shall name as the insured the Contractor, and the Owner.

16. CONTRACT SECURITY

A. The Contractor shall within ten days after the receipt of the Notice of Award furnish the Owner and the Commission with a Performance Bond and a Payment Bond in penal sums

equal to the amount of the Contract Price, conditioned upon the performance by the Contractor of all undertakings, covenants, terms, conditions and agreements of the Contract Documents, and upon the prompt payment by the Contractor to all persons supplying labor and materials in the prosecution of the Work provided by the Contract Documents. Such Bonds shall be executed by the Contractor and a corporate bonding company licensed to transact such business in the State in which the Work is to be performed and named on the current list of "Surety Companies Acceptable on Federal Bonds" as published in the Treasury Department Circular Number 570, provided that the contract amount shall not exceed the underwriting limitation listed for the surety in Circular 570. For contracts in excess of $100,000.00, the Bonds shall be issued by a Bonding Company by the A.M. BEST Rating Book as follows:

i. contracts in excess of $100,000.00, but less than $1,000,000.00 - "B+" rating or higher and contract amount may not exceed 2.0% of the policyholder's surplus.
ii. contracts in excess of $1,000,000.00 - "A" rating or higher and contracts may not exceed 2.0% of the policyholder's surplus.

B. In addition, the Bonds shall be executed by an Agent licensed by the Insurance Commissioner of the State of Arkansas to represent the surety company executing the bonds. The mere countersigning of a bond will not be sufficient. The Agent shall file with the bonds its Power of Attorney. The expense of these Bonds shall be borne by the Contractor. If at any time a surety on any such Bond is declared bankrupt or loses its right to do business in the State of Arkansas or is removed from the above list of Surety Companies, the Contractor shall notify the Owner, Engineer, and the Commission and substitute an acceptable Bond (or Bonds) in such form and sum and signed by such other surety or sureties as may be satisfactory to the Owner and Commission. The Contractor shall pay the premiums on such Bond. No further payment shall be deemed due nor shall be made until the new surety or sureties shall have furnished an acceptable Bond to the Owner and the Commission

17. ASSIGNMENTS

The Contractor shall not sell, transfer, assign or otherwise dispose of the Contract or any portion thereof, or of any right, title or interest therein, or any obligations thereunder, without written consent of the Owner.

18. INDEMNIFICATION

A. The Contractor will indemnify and hold harmless the Owner and the Engineer and their agents and employees from and against all claims; damages, losses and expenses including attorney's fees arising out of or resulting from the performance of the Work, provided that any such claims, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction or tangible property including the loss of use resulting therefrom; and is caused in whole or in part by any negligent or willful act or omission of the Contractor, and Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable.

B. In any and all claims against the Owner or the Engineer, or any of their agents or employees, by any employee of the Contractor, any Subcontractor, anyone directly or

indirectly employed by any of them, or anyone for whose acts any of them may be liable, the indemnification obligation shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for the Contractor or any Subcontractor under worker's compensation acts, disability benefits acts or other employee benefits acts.

C. The obligation of the Contractor under this paragraph shall not extend to the liability of the Engineer, its agents or employees arising out of the preparation or approval of maps, Drawings, opinions, reports, surveys, Change Orders, designs or Specifications.

19. SEPARATE CONTRACTS

A. The Owner reserves the right to let other contracts in connection with this Project. The Contractor shall afford other Contractors reasonable opportunity for the introduction and storage of their materials and the execution of their Work, and shall properly connect and coordinate the Work with theirs. If the proper execution or results of any part of the Contractor's Work depends upon the Work of any other Contractor, the Contractor shall inspect and promptly report to the Engineer any defects in such Work that render it unsuitable for such proper execution and results.

B. The Owner may perform additional Work related to the Project or the Owner may let other contracts containing provisions similar to these. The Contractor will afford the other Contractors who are parties to such contracts (or the Owner, if the Owner is performing the additional Work) reasonable opportunity for the introduction and storage of materials and equipment and the execution of Work, and shall properly connect and coordinate the Work with theirs.

C. If the performance of additional Work by other Contractors or the Owner is not noted in the Contract Documents prior to the execution of the Contract, written notice thereof shall be given to the Contractor prior to starting any such additional Work. If the Contractor believes that the performance of such additional Work by the Owner or others involves it in additional expense or entitles it to an extension of the Contract Time, the Contractor may make a claim thereof as provided in Sections 15 and 16.

20. SUBCONTRACTING

A. The Contractor may utilize the services of specialty Subcontracts on those parts of the Work which, under normal contracting practices, are performed by specialty Subcontractors.

B. The Contractor shall not award Work to Subcontractor(s), in excess of fifty percent of the Contract Price, without prior written approval of the Owner.

C. The Contractor shall be fully responsible to the Owner for the acts and omissions of its Subcontractors, and of persons either directly or indirectly employed by them, as the Contractor is for the acts and omissions of persons directly employed by the Contractor.

D. The Contractor shall cause appropriate provisions to be inserted in all subcontracts relative to the Work to bind Subcontractors to the Contractor by the terms of the Contract Documents insofar as applicable to the Work of Subcontractors and to give the Contractor the same power as regards terminating any subcontract that the Owner may exercise over the Contractor under any provision of the Contract Documents.

E. Nothing contained in this Contract shall create any contractual relationship between any Subcontractor and the Owner.

21. PRE-CONSTRUCTION CONFERENCE

A Pre-Construction Conference (PCC) will be held following the RLF loan closing, the review of bid documents by the Commission, and the Award of the construction contract(s). Work orders will not be issued until after the PCC is held and the Contractor has furnished an acceptable completion schedule as described by these Supplemental General Conditions. The PCC shall be attended by the Owner, Engineer, Contractor(s), and representatives of the Commission. The purpose of the conference will be to define the roles and responsibilities of the Owner, the Commission, the Engineer and all Contractors during the performance of the Contract.

22. SCHEDULES, REPORTS AND RECORDS

A. The Contractor shall submit to the Owner and the Engineer such schedule of quantities and costs, progress schedules, payrolls, reports, estimates, records and other data where applicable as are required by the Contract Documents for the Work to be performed. One copy of the up-to-date schedule shall be maintained at the job site.

B. Prior to the first partial payment estimate, the Contractor shall submit construction progress schedules showing the order in which the Contractor proposes to carry on the Work, including dates at which the various parts of the Work will be started, estimated date of completion of each part and, as applicable:
   i. The dates at which special detailed drawings will be required; and
   ii. Respective dates for submission of Shop Drawings, the beginning of manufacture, the testing and the installation of materials, supplies and equipment.

C. The Contractor shall also submit a schedule of payments that the Contractor anticipates will be earned during the course of the Work that must be updated each month.

23. JOB BULLETIN BOARD

The Contractor shall maintain a weather-tight job bulletin board in an area frequented by the Contractor's employees for the duration of construction. The job bulletin board shall display at a minimum a copy of the Davis-Bacon Wage Decision, a Davis-Bacon poster, a notice to employees concerning minimum wage requirements, Equal Employment Opportunity (Labor Standards) information, and a notice to labor unions as applicable. A copy of the construction schedule (i.e. critical path chart) is to be placed on the job bulletin board and updated monthly, showing project progress.

24. SHOP DRAWINGS

A. The Contractor shall provide Shop Drawings as may be necessary for the prosecution of the Work as required by the Contract Documents. The Engineer shall promptly review all Shop Drawings. The Engineer's approval of any Shop Drawings shall not release the Contractor from responsibility for deviations from the Contract Documents. The approval of any Shop Drawings, which substantially deviates from the requirement of the Contract Documents, shall be evidenced by a Change Order.

B. When submitted for the Engineer's review, Shop Drawings shall bear the Contractor's certification that he has reviewed, checked and approved the Shop Drawings and that they are in conformance with the requirements of the Contract Documents.

C. Portions of the Work requiring Shop Drawings or submission of samples shall not begin until the Shop Drawings or submissions have been approved by the Engineer. A copy of each approved Shop Drawing and each approved sample shall be kept in good order by the Contractor at the site and shall be available to the Engineer.

25. MATERIALS, SERVICES AND FACILITIES

A. It is understood that, except as otherwise specifically stated in the Contract Documents, the Contractor shall provide and pay for all materials, labor, tools, equipment, water, lights, power, transportation, supervision, temporary construction of any nature, and all other services and facilities of any nature whatsoever necessary to execute, complete and deliver the Work within the specified time.

B. Materials and equipment shall be so stored as to insure the preservation of their quality and fitness for the Work. Stored materials and equipment to be incorporated in the Work shall be located so as to facilitate prompt inspection. Materials not located in or near the project site will not be eligible for re-imbursement.

C. Manufactured articles, materials, and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned as directed by the Manufacturer.

D. Materials, supplies, and equipment shall be in accordance with samples submitted by the Contractor and approved by the Engineer.

E. Materials, supplies or equipment to be incorporated into the Work shall not be purchased by the Contractor or the Subcontractor subject to a chattel mortgage or under a conditional sale contract or other agreement by which an interest is retained by the Seller.

26. SAFETY STANDARDS

A. The Contractor is responsible for complying with the Department of Labor Safety and Health Regulations promulgated under Section 107 of the Contract Work Hours and Safety Standard Act (40 U.S.C. 327-333). The Contractor shall not require any laborer or mechanic employed in the performance of the contract to work in surroundings or under working conditions which are unsanitary, hazardous, or dangerous to his health or safety,

as determined under construction safety and health standards promulgated by regulations of the Secretary of Labor.

Job site situations which pose an immediate and serious threat to life or safety will be referred to the Occupational Safety and Health Administration (OSHA).

B. Act 291 of the 1993 Arkansas General Assembly applies to all public improvement construction projects that involve any trench or excavation which equals or exceeds five feet in depth. Beginning March 1, 1993, Act 291 requires that:
   i. The current edition of Occupational Safety and Health Administration Standard for Excavation and Trenches Safety System, 29 CFR 1926, Subpart P, be specifically incorporated into the specifications for the project; and
   ii. The contract bid form include a separate pay item for trench and excavation safety systems and be included in the base bid.

In the event that a Contractor fails to complete a separate pay item in accordance with the Act, the Owner shall declare that the bid fails to comply fully with the specifications and the bid will be considered invalid as a non-responsive bid.

The Owner shall notify the Safety Commission of the State Department of Labor of the award of a contract covered by this Act.

27. PROTECTION OF LIVES AND PROPERTY

A. In order to protect the lives and health of its employees under the contract, the Contractor shall comply with all pertinent provisions of the "Manual of Accident Prevention in Construction" issued by the Associated General Contractors of America, Inc., and shall maintain an accurate record of all cases of death, occupational disease, and injury requiring medical attention or causing loss of time from work, arising out of and in the course of employment or work under the contract.

B. The Contractor alone shall be responsible for the safety, efficiency, and adequacy of its plant, appliances and methods and for any damage which may result from his failure or his improper construction, maintenance or operation.

28. PROTECTION OF WORK, PROPERTY, AND PERSONS

A. The Contractor will be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. The Contractor will take all necessary precautions for the safety of, will provide the necessary precautions for the safety of, and will provide the necessary protection to prevent damage, injury or loss to all employees on the Work and other persons who may be affected thereby, all the Work and all materials or equipment to be incorporated therein, whether in storage on or off the site, and other property at the site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction.

B. The Contractor will comply with all applicable laws, ordinances, rules, regulations and orders of any public body having jurisdiction. The Contractor will erect and maintain, as required by the conditions and progress of the Work, all necessary safeguards for safety and protection. The Contractor will notify owners of adjacent utilities when prosecution of the Work may affect them. The Contractor will remedy all damage, injury or loss to any property caused, directly or indirectly, in whole or part, by the Contractor, any Subcontractor or anyone directly or indirectly employed by any of them or anyone for whose acts any of them be liable, except damage or loss attributable to the fault of the Contract Documents or to the acts or omissions of the Owner, of the Engineer or anyone employed by either of them or anyone for whose acts either of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of the Contractor.

C. In emergencies affecting the safety of persons or the Work or property at the site or adjacent thereto, the Contractor, without special instructions or authorization from the Engineer or Owner, shall act to prevent threatened damage, injury or loss. The Contractor will give the Engineer prompt Written Notice of any significant changes in the Work or deviations from the Contract Documents caused thereby, and a Change Order shall thereupon be issued covering the changes and deviations involved.

29. PROTECTION OF THE ENVIRONMENT

The Contractor will provide for protection of the environment as required by the Contract Documents, Local Ordinance, State and Federal Law and these Supplemental General Conditions. The Contractor shall:

i. Limit the area of construction disturbance to areas within temporary and permanent easements and the land areas designated for the Contractors use in performing the work.
ii. Provide for the protection of trees, shrubs and grass wherever possible.
iii. Provide for the prevention of air pollution through burning permits as required. The Contractor shall provide dust control on haul roads as site conditions dictate.
iv. Control noise pollution by providing efficient mufflers on all machinery and limiting work hours if required by the Contract Documents.
v. Control excessive erosion and sedimentation at the job site through prompt seeding of disturbed areas and the construction of temporary control measures as required in the contract documents and by Storm Water Permits.
vi. Perform the work in coordination with the Owner and in a manner that will provide for the continuous transport and treatment of wastewater during construction.
vii. Cease all work in areas where species classified as threatened or endangered under the Endangered Species Act (Public Law 93-205 as amended) are discovered and promptly notify the Engineer.

30. ARCHAEOLOGICAL, HISTORICAL, AND CULTURAL REMAINS

The Contractor shall immediately stop all work in any area where artifacts of archaeological, historical or cultural significance are found and notify the Engineer. The Owner shall notify the Commission, the State Advisory Council on Historic Preservation and the Arkansas Natural Heritage Commission of the discovery.

31. STORM WATER PERMIT REQUIREMENTS

A. The Contractor is advised that if this construction activity involves clearing, grading or excavation activities that result in the disturbance of one or more acres of total land area including areas which are part of the total RLF project, this activity is subject to Storm Water Permit Requirements of the Arkansas Department of Environmental Quality. The Owner will obtain an NPDES General Stormwater Permit for construction activities (ARR150000). The Contractor is responsible for compliance with all terms and conditions of the General Permit. Most RLF projects are eligible for inclusion under the General Permit.

B. The General Permit requires the control of the entrance of pollutants into the surface and ground waters of the State. Temporary and permanent sediment and erosion control measures must be included in the Work during the course of construction. These measures may include temporary and permanent seeding, construction of catch basins, the use of mulch, straw bales and silt fences to control sediments, the use of riprap at erosion-prone areas, and other measures.

C. The General Permit also requires maintenance and "good housekeeping practices" that include items such as proper waste disposal, proper storage for hazardous materials and designating safe places for equipment maintenance and wash-down.

D. The Contractor is required to maintain on-site a Stormwater Pollution Prevention Plan describing the storm water pollution prevention measures that will be taken at the construction site. The Plan must include a site description, a description of the nature of the activity, the intended sequence of the work, estimates of the total area involved in the activity, an estimate of the possible volume of runoff from the area, site maps showing drainage patterns, pollution prevention measures that will be taken, and other items.

E. The Contractor is responsible for implementation of Best Management Practices described within the Stormwater Pollution Prevention Plan.

F. The Contractor shall be responsible for implementing all applicable requirements of the Owner's ADEQ General Stormwater Permit for Construction Activity, 401 Water Quality Certification, the COE Section 404 Permit, the ADEQ Short-Term Activity Authorization, the SPCCP, the USFWS recommendations for cave protection, local Municipal Separate Storm Sewer requirements, and all other environmental regulatory requirements that are associated with the construction activities that the Contractor is to perform.

G. Additional information and application materials may be obtained by writing to the Arkansas Department of Environmental Quality's Storm Water Permits Section.

32. ENGINEER'S AUTHORITY

A. The Engineer shall act as the Owner's representative during the construction period, shall decide questions which may arise as to quality and acceptability of materials furnished and Work performed, and shall interpret the intent of the Contract Documents in a fair and unbiased manner. The Engineer will make visits to the site and determine if the Work is proceeding in accordance with the Contract Documents.

B. The Contractor will be held strictly to the intent of the Contract Documents in regard to the quality of materials, workmanship, and execution of the Work. Inspections may be made at the factory or fabrication plant of the source of material supply.

C. The Engineer will not be responsible for the construction means, controls, techniques, sequences, procedures, or construction safety.

D. The Engineer shall promptly make decisions relative to interpretation of the Contract Documents.

33. OWNER'S PROTECTION FROM CONTRACTOR'S ACTIONS

The Engineer may withhold or, on account of subsequently discovered evidence, nullify the whole or part of any approved partial payment estimate to such extent as may be necessary to protect the owner from loss on account of:

i. Defective work not remedied.
ii. Claims filed or reasonable evidence indicating probable filing of claims.
iii. Failure of Contractor to make payments properly to Subcontractors or for material or labor.
iv. A reasonable doubt that the work can be completed for the balance then unpaid.
v. Damage to another Contractor.
vi. Performance of work in violation of the terms of the contract documents.

34. INSPECTION AND TESTING

A. All materials and equipment used in the construction of the Project shall be subject to adequate inspection and testing in accordance with generally accepted standards, as required and defined in the Contract Documents.

B. The Owner shall provide for full time inspection of the work by the Engineer to assure the work is being performed in accordance with the approved plans, specifications and change orders; and in accordance with sound engineering principles and building practices.

The Resident Inspector(s) of the Owner will perform required inspections and tests and maintain on-site records as assurance that the work conforms to the contract requirements. The Resident Inspector shall make available to the Owner and Commission representatives adequate records of such inspections and tests. Failed tests with passing retests will be clearly marked in the project records.

C. The Contractor will maintain an adequate inspection and supervision system and perform required inspections and tests to assure that the work conforms to the contract requirements. The Contractor will make available to the Owner and the Commission adequate records of such inspections and tests. Failed tests with passing re-tests will be clearly marked in the project records.

D. If laws, ordinances, or regulations of any public body having jurisdiction require any Work (or part thereof) to specifically be inspected, tested, or approved by an employee or other representative of such public body, the Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish the Engineer the required certificates of inspection or approval.

E. Inspections, tests, or approvals by the Engineer or others shall not relieve the Contractor from the obligations to perform the Work in accordance with the requirements of the Contract Documents and Specifications.

F. The Engineer and the Engineer's representatives will at all times have access to the Work. In addition, authorized representatives and agents of any participating State agency shall be permitted to inspect all work, materials, payrolls, records or personnel, invoices of materials, and other relevant data and records. The Contractor will provide proper facilities for such access and observation of the Work and also for any inspection or testing thereof.

G. The Commission will make periodic engineering and administrative inspections of the project to examine project records, monitor progress and inspect the work for conformance with contract requirements. The Commission shall notify the Owner and the Engineer of any observed deficiencies in the completed construction, procedures or materials used in construction, resident inspection, engineering supervision, financial management or any violation of loan program requirements. The Commission will require the Owner to take such action as may be necessary to correct any such observed deficiency.

H. If any Work is covered contrary to the written instructions of the Engineer it must, if requested by the Engineer, be uncovered for the Engineer's observation and replaced at the Contractor's expense.

I. If the Engineer considers it necessary or advisable that covered Work be inspected or tested by others, the Contractor, at the Engineer's request, will uncover, expose or otherwise make available for observation, inspection or testing as the Engineer may require, that portion of the Work in question, furnishing all necessary labor, materials, tools, and equipment. If it is found that such Work is defective, the Contractor will bear all the expenses of such uncovering, exposure, observation, inspection and testing and of satisfactory reconstruction, if however, such Work is not found to be defective, the Contractor will be allowed an increase in the Contract Price or an extension of the Contract Time, or both, directly attributable to such uncovering, exposure, observation, inspection, testing and reconstruction and an appropriate Change Order shall be issued.

J. The Contractor shall maintain books, records, documents and other evidence directly pertinent to performance on RLF funded work under this agreement in accordance with the provisions of these Contract Documents. The Contractor shall also maintain the financial information and data used in the preparation or support of the cost submission required for a change order and a copy of the cost summary submitted to the Owner. The Owner and the Commission or any of their authorized representatives shall have access to all such books, records, documents and other evidence for the purpose of inspection, audit and copying during normal business hours. The Contractor will provide proper facilities for such access and inspection.

K. Upon completion of all project construction, the Commission will schedule a final inspection within thirty days of receipt of a written certification by the Owner that construction is ready for a final inspection. Prior to approval of the final construction payment, the Commission will verify that all construction is complete in accordance with plans, specifications and approved change orders, all equipment has been purchased and installed, the final contract amounts have been agreed to by Change Order, as-built drawings are complete, and the Owner has prepared an operation and maintenance manual that includes contractor supplied data as required by these Supplemental General Conditions.

Following an acceptable Final Inspection by the Commission, the Commission will provide written acceptance to the Owner of the project and the final construction payment can be requested. The Commission will not approve the final construction payment until the Owner and the Contractor has complied with the requirement for the release of final payment as outlined in these Supplemental General Conditions.

35. SUPERVISION BY CONTRACTOR

The Contractor will supervise and direct the Work. He will be solely responsible for the means, methods, techniques, sequences and procedures of construction. The Contractor will employ and maintain on the Work a qualified supervisor or superintendent who shall have been designated in writing by the Contractor as the Contractor's representative at the site. The Supervisor shall have full authority to act on behalf of the Contractor and all communications given to the supervisor shall be as binding as if given to the Contractor. The Supervisor shall be present on the site at all times as required to perform adequate supervision and coordination of the Work.

36. PAYMENT TO CONTRACTOR

A. Disbursements from the State Revolving Loan Fund (RLF) Programs shall be made monthly based upon actual work performed and materials stored on site less retainage. Funds will not be disbursed from the RLF without approval by the Commission. The Commission will approve disbursements provided the Owner (loan recipient) and the Contractor are in compliance with the provisions of these contract documents and RLF regulations. Contract cost overruns approved by the Commission but in excess of the loan amount must be funded by the Owner or through an additional loan. Contract cost overruns not approved by the Commission must be funded by the Owner.

B. Each month, at least ten days before each progress payment falls due (but not more often than once a month), the Contractor shall prepare and submit to the Engineer a progress estimate acceptable in form and content to the Engineer and the Commission supported by such data as the Engineer may reasonably require. The estimate shall show a detailed breakdown of the amount of work completed previously, amount of work completed this period, amount of work completed to date, the amount of retainage, and the quantity and value of materials and equipment currently stored on site that have not been incorporated into the work. Partial payment requests will be placed on the form provided by the Commission and must include a reduced scale copy of the updated construction schedule. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at or near the site, the partial payment estimate shall also be accompanied by such supporting data, satisfactory to the Owner as will establish Owner's title to the material and equipment and protect the Owner's interest therein, including applicable insurance.

   The progress payment request shall also include a certification by the Contractor that it has complied with all labor standards. The Certification may be placed in the content of the progress payment request or Commission form "Certification by Contractor of Labor Standards Compliance" may be attached to the payment request. No disbursement request will be approved by the Commission without this certification. Furthermore, the Owner will provide the Commission a letter with each pay request certifying wages, through payroll review and employee interviews, met the Davis-Bacon Requirements of this contract. Copies of completed interviews will be forwarded to the Commission.

   The Engineer will, within ten days after receipt of each partial payment estimate, either indicate in writing approval of payment, and present the partial payment estimate to the Owner or return the partial payment estimate to the Contractor indicating in writing the reasons for refusing to approve payment. In the latter case, the Contractor may make the necessary corrections and resubmit the partial payment estimate. The Owner will, within ten days of presentation of an approved partial payment estimate, pay the Contractor a progress payment on the basis of the approved partial payment estimate less the retainage.

   Retainage will be in accordance with state law (Arkansas Code of 1987 as amended, Annotated 22-9-604) and as described herein. The retainage shall be an amount equal to five percent of said estimate (excluding Section C. below). Upon final completion of the work, any amount retained may be paid to the Contractor. When the Work has been completed except for Work which cannot be completed because of weather conditions, lack of materials or other reasons which in the judgement of the Owner are valid reasons for non-completion, the Owner may make additional payments, retaining at all times an amount sufficient to cover the estimated cost of the Work still to be completed.

C. In compliance with Arkansas Code Ann. §17-25-404 (1995), ten percent may be withheld from the Engineer's estimate until a proper statement or certificate is received from the Contractors Licensing Board stating that the required bond has been filed and that the Contractor is otherwise in compliance with Arkansas Code Ann. §17-25-404 (1995).
   i. That no compensating tax is due the State under the contract.

ii. That the tax due under the contract has been paid.
iii. That a suitable surety bond has been provided by the Contractor and approved by the Contractors Licensing Board as prescribed in the Act.

D. The Owner shall request payment on Disbursement Request Form supplied during the Pre-Construction Conference. The requested amount shall not exceed the current amounts approved for construction, engineering and other project costs on individual line items. Only those individuals authorized to represent the Owner and the Engineer shall sign the Disbursement Request Form. Documentation for costs incurred since the last disbursement request must accompany each pay request including the Contractor's monthly pay estimate with attachments as described in these Supplemental General Conditions and invoices for engineering, administrative, and legal services as well as approved equipment costs.

E. The Owner is required to submit one copy of the completed Disbursement Request Form and all supporting documentation to the Commission for processing; the deadlines for all disbursements from the City to the Commission will be discussed at the Preconstruction Conference. Disbursement requests not received at the Commission prior to the deadlines established in the Preconstruction Conference will not be processed and paid until the following month.

For the Owner to realize this deadline, Contractor estimates should be received by the Engineer on or before the 10th day of each month. The actual due date for Contractor estimates shall be as established by the Contract Documents or by the Engineer.

F. Disbursements from the RLF are generally received by the Owner (loan recipient) from the Arkansas Development Finance Authority (ADFA) within the first ten working days of the month. The Owner shall promptly pay all bills due as disbursements are made from the RLF.

G. Prior to Substantial Completion, the Owner with the approval of the Engineer and with the concurrence of the Contractor, may use any completed or substantially completed portions of the Work. Such use shall not constitute an acceptance of such portions of the Work.

H. The Owner shall have the right to enter the premises for the purpose of doing work not covered by the Contract Documents. This provision shall not be construed as relieving the Contractor of the sole responsibility for the care and protection of the Work, or the restoration of any damaged Work except such as may be caused by agents or employees of the Owner.

I. Upon completion and acceptance of the Work, the Engineer shall issue a certificate attached to the final payment request that the Work has been accepted under the conditions of the Contract Documents. The entire balance found to be due the Contractor, including the retained percentages, but except such sums as may be lawfully retained by the Owner shall be paid to the Contractor within thirty days of completion and acceptance of the Work.

J. The Contractor will indemnify and save the Owner or the Owner's gents harmless from all claims growing out of the lawful demand of Subcontractors, laborers, workmen, mechanics, materialmen, and furnishers of machinery and parts thereof, equipment, tools and all supplies, incurred in the furtherance of the performance of the Work. The Contractor shall, at the Owner's request, furnish satisfactory evidence that all obligations of the nature designated above have been paid, discharged, or waived. If the Contractor fails to do so the Owner may, after having notified the Contractor, either pay unpaid bills or withhold from the Contractor's unpaid compensation a sum of money deemed reasonably sufficient to pay any and all such lawful claims until satisfactory evidence is furnished that all liabilities have been fully discharged whereupon payment to the Contractor shall be resumed in accordance with the terms of the Contract Documents, but in no event shall the provisions of this sentence be construed to impose any obligations upon the Owner to either the Contractor, the Contractor's Surety, or any third party. In paying any unpaid bills of the Contractor, any payment so made by the Owner shall be considered as a payment made under the Contract Documents by the Owner to the Contractor and the Owner shall not be liable to the Contractor for any such payments made in good faith.

K. If the Owner fails to make payment thirty days after approval by the Engineer, in addition to other remedies available to the Contractor, there shall be added to each such payment interest at the maximum legal rate commencing on the first day after said payment is due and continuing until the payment is received by the Contractor.

L. In addition to the Contract Time specified in these Contract Documents, the Bond Purchase Agreement between the Owner and the Commission contains an estimated completion date beyond which no further loan disbursements will be made without specific written waiver by ADFA and the Commission. ADFA and the Commission will grant waivers only where there is sufficient documented evidence that project completion was delayed through no fault of the Contractor and the Owner.

Regardless of the existence of circumstances where a delay in completion is beyond the control of the Contractor and the Owner, a waiver to the estimated completion date will not be granted should the granting of such waiver harm any commitments made to the purchasers of Revolving Loan Fund Bonds issued by ADFA. Should a wavier be denied, the Owner must complete the project with its own funds or apply for an additional loan from the RLF program.

37. ACCEPTANCE OF FINAL PAYMENT AS RELEASE

The acceptance of the Contractor of final payment shall be and shall operate as a release to the Owner of all claims and all liability to the Contractor other than claims in stated amounts as may be specifically excepted by the Contractor for all things done or furnished in connection with this Work and for every act and neglect of the Owner and others relating to or arising out of this Work. Any payment, however, final or otherwise, shall not release the Contractor or its sureties from any obligations under the Contract Documents or the Performance and Payment Bonds.

38. CLEANUP AND CORRECTIONS

Where work on unit price items are substantially complete but lack clean-up and/or corrections ordered by the Engineer, amounts shall be deducted from unit prices in partial payment estimates to amply cover such clean-up and corrections.

39. TAXES

The Contractor will pay all sales, consumer, use and other similar taxes required by the laws of the place where the Work is performed.

40. STATE TAX EXEMPTION

This section only applies with projects receiving Clean Water Revolving Loan Funds; Drinking Water Revolving Loan Funds can not receive this benefit. Except were applicable below, the Contractor will pay all sales, consumer, use and other similar taxes required by the laws of the place where the Work is performed. Machinery and equipment purchased by the Contractor for installation under this contract may be exempt from Arkansas Sales Tax. Arkansas Department of Finance and Administration Regulation GR-66 states that the gross proceeds derived from the sale of pollution control machinery and equipment are exempt from the tax if:

i. The machinery and equipment is utilized, either directly or indirectly, by manufacturing or processing plants or facilities, or cities or towns in Arkansas to prevent or reduce air or water pollution or contamination which might otherwise result from the operation of the plant or facility; and,
ii. The machinery and equipment is required by Arkansas or federal law or regulations to be installed and utilized to control pollution or contamination as evidenced by written documentation from the Arkansas Natural Resources Commission or the Environmental Protection Agency.
iii. Supplies and chemicals used by pollution control machinery and equipment are taxable.

Should the contract involve the installation of pollution control machinery and equipment at a treatment facility, the Arkansas Department of Environmental Quality will furnish a written general certification to document that the machinery and equipment is required by Arkansas or federal law. A request for written documentation should be sent to the Arkansas Department of Environmental Quality's NPDES Permit Branch, Water Division.

To claim the exemption, the Contractor must provide the vendor with a copy of the documentation. The invoice must show that the purchase is for pollution control machinery and equipment under Arkansas Code Annotated 26-53-114. Most ancillary items necessary to install the equipment do not qualify for tax exemption. Any questions involving the definition of machinery and equipment should be directed to the Arkansas Department of Finance and Administration's Sales and Use Tax Section.

41. OPERATION AND MAINTENANCE MANUAL

A. The Contractor shall furnish four copies of all operation, maintenance, repair and replacement manuals, and product data for all equipment supplied by the Contractor to the Engineer. The Engineer shall not certify payments requesting more than eighty percent of the Contract amount until such time as all operation, maintenance, repair and replacement manuals, and product data has been furnished by the Contractor to the Engineer.

B. The Engineer is required to obtain approval from the Commission of the project operation and maintenance manual prior to the release of the final construction payment.

42. CHANGES IN THE WORK

A. The Owner may at any time, as the need arises, order changes within the scope of the Work without invalidating the Agreement. If such changes increase or decrease the amount due under the Contract Documents, or in the time required for performance of the Work, an equitable adjustment shall be authorized by Change Order.

B. All changes should be recorded and approved on a contract Change Order so that they may be included in partial payment estimates. The Commission must approve all contract Change Orders prior to commencing with the associated Work. When drafting Change Orders, the Engineer will use the RLF form provided by the Commission.

C. All changes, which affect the cost of the construction of the Project, must be authorized by means of a contract Change Order. The contract Change Order will include extra work, work for which quantities have been altered from those shown in the bidding schedule, as well as decreases or increases in the quantities of installed units which are different than those shown in the bidding schedule because of final measurements.

In the case of defective specifications for which the Owner is responsible, the equitable adjustment shall include any increased cost the Contractor reasonably incurred in attempting to comply with those defective specifications.

Where justified, adjustments to the Contract Time specified in the Contract Documents shall be made in conjunction with changes in the work and with equitable adjustments in the contract price as described in these Supplemental General Conditions. Where delays in project completion are not due to changes in the work or acts of the Owner, extensions to the contract time will be made only where there is sufficient documented evidence that delays in project completion were caused by events beyond the contractor's control.

The Owner shall promptly investigate the conditions and if found that conditions materially differ, the Owner will cause an increase or decrease in the Contractor's cost or the time required to perform any part of the work under this agreement as applicable.

The Contractor shall promptly, and before such conditions are disturbed, notify the Owner in when differing site conditions occur. Notification will come in the writing with:

i. Subsurface or latent physical conditions at the site differing materially from those indicated in this agreement, or

ii. Unknown physical conditions at the site, of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in this agreement.

No claim of the Contractor for increased cost or time due to differing site conditions shall be allowed unless the Contractor has given a written notice of the differing site conditions within thirty days of the discovery of such conditions.

D. The Contractor shall document the necessity of all claims for additional cost and time in writing and shall provide detailed cost and time estimates to the Engineer for all proposed contract changes. The Engineer shall review the supporting documents and estimates provided by the Contractor for reasonableness and shall as necessary develop independent cost estimates of the proposed contract changes to assure that the cost of the proposed change is fair and reasonable.

E. The Owner shall provide sufficient information such as a description and justification for the change, drawings, the Contractor's proposal and other supporting documentation to the Commission for review. The Owner shall promptly notify the Commission in writing of events or proposed changes which may substantially alter the design and scope of the Project, alter the type of treatment provided or the location, size, capacity, or quality of any major item of equipment or treatment unit, or exceed the amount of funds available to complete the project.

F. The Contract Price may be changed only by a Change Order. The value of any Work covered by a Change Order or of any claim for increase or decrease in the Contract Price shall be determined by one or more of the following methods in the order of precedence listed below:
   i. Unit prices previously approved.
   ii. An agreed lump sum.

G. Should project changes increase the amount of funds necessary to complete the Project beyond the initial loan amount, the Owner must fund the project changes or apply to the Commission for monies to cover the cost overruns.

H. The Engineer, also, may at any time, by issuing a Field Order, make changes in the details of the Work. The Contractor shall proceed with the performance of any changes in the Work so ordered by the Engineer unless the Contractor believes that such Field Order entitles the Contractor to change in Contract Price or Time, or both, in which event the Contractor shall give the Engineer written notice thereof within seven days after the receipt of the ordered change. Thereafter the Contractor shall document the basis for the change in Contract Price or Time within thirty days. The Contractor shall not execute such changes pending the receipt of an executed Change Order or further instruction from the Owner.

43. SUBSURFACE CONDITIONS

A. The Contractor shall promptly, and before such conditions are disturbed, except in the event of an emergency, notify the Owner by Written Notice of:

i. Subsurface or latent physical conditions at the site differing materially from those indicated in the Contract Documents; or
ii. Unknown physical conditions at the site, of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in Work of the character provided for in the Contract Documents.

B. The Owner shall promptly investigate the conditions, and if it is found that such conditions do so materially differ and cause an increase or decrease in the cost of, or in the time required for, performance of the Work, an equitable adjustment shall be made and the Contract Documents shall be modified by a Change Order. Any claim of the Contractor for adjustment hereunder shall not be allowed unless the required Written Notice has been given; provided that the Owner may, if the Owner determines the facts so justify, consider and adjust any such claims asserted before the date of final payment.

44. CORRECTION OF WORK

A. The Contractor shall promptly remove from the premises all Work rejected by the Engineer for failure to comply with the Contract Documents, whether incorporated in the construction or not, and the Contractor shall promptly replace and re-execute the Work in accordance with the Contract Documents and without expense to the Owner and shall bear the expense of making good all Work of other Contractors destroyed or damaged by such removal or replacement.

B. All removal and replacement Work shall be done at the Contractor's expense. If the Contractor does not take action to remove such rejected Work within ten days after receipt of Written Notice, the Owner may remove such Work and store the materials at the expense of the Contractor.

45. SURVEYS, PERMITS, REGULATIONS

A. The Owner, through the Engineer, shall furnish all boundary surveys and establish all base lines for locating the principal component parts of the Work together with a suitable number of bench marks adjacent to the Work as shown in the Contract Documents. From the information provided by the Engineer unless otherwise specified in the Contract Documents, the Contractor shall develop and make all detail surveys needed for construction such as slope stakes, batter boards, stakes for pipe locations and other working points, lines, elevations and cut sheets.

B. The Contractor shall carefully preserve bench marks, reference points and stakes and, in case of willful or careless destruction, shall be charged with the resulting expense and shall be responsible for any mistake that may be caused by their unnecessary loss or disturbance.

C. Permits and licenses of a temporary nature necessary for the prosecution of the Work shall be secured and paid for by the Contractor unless otherwise stated in the Supplemental General Conditions. Permits, licenses and easements for permanent structures or permanent changes in existing facilities shall be secured and paid for by the Owner, unless otherwise specified. The Contractor shall give all notices and comply with all laws, ordinances, rules and regulations bearing on the conduct of the Work as drawn and

specified. If the Contractor observes that the Contract Documents are at variance therewith, the Contractor shall promptly notify the Engineer in writing, and any necessary changes shall be adjusted as provided in Section 42, CHANGES IN THE WORK.

46. TIME FOR COMPLETION AND LIQUIDATED DAMAGES

A. The date of beginning and the time for completion of the Work are essential conditions of the Contract Documents and the Work embraced shall be commenced on a date specified in the Notice to Proceed.

B. The Contractor will proceed with the Work at such rate of progress to insure full completion within the Contract Time. It is expressly understood and agreed, by and between the Contractor and the Owner that the Contract Time for the completion of the Work described herein is a reasonable time, taking into consideration the average climatic and economic conditions and other factors prevailing in the locality of the Work.

C. If the Contractor shall fail to complete the Work within the Contract Time, or extension of time granted by the Owner, then the Contractor will pay to the Owner the amount for liquidated damages as specified in the Bid for each calendar day that the Contractor shall be in default after the time stipulated in the Contract Documents.

D. The Contractor shall not be charged with liquidated damages or any excess cost when the delay in completion of the Work is due to the following and the Contractor has promptly given Written Notice of such delay to the Owner or Engineer.
   i. To any preference, priority or allocation order duly issued by the Owner.
   ii. To unforeseeable causes beyond the control and without the fault or negligence of the Contractor, including but not restricted to, acts of God, or of the public enemy, acts of the Owner, acts of another Contractor in the performance of a contract with the Owner, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, and abnormal and unforeseeable weather; and
   iii. To any delays of Subcontractors occasioned by any of the causes specified in paragraphs (i.) and (ii) of this article.

E. Where justified, adjustments to the Contract Time specified in the Contract Documents shall be made in conjunction with changes in the work and with equitable adjustments in the contract price as described in these Supplemental General Conditions. Where delays in project completion are not due to changes in the work or acts of the Owner, extensions to the contract time will be made only where there is sufficient documented evidence that delays in project completion were caused by events beyond the Contractor's control. Requests for time extensions by the Contractor must be submitted with the pay estimate for the month that the lost days are being sought.

F. Notification procedures.
   i. At eighty percent completion of project construction time the Engineer will contact in writing the Surety Company, the Contractor, the Owner, and the Funding Agencies. The letter will contain contract specific language concerning time left in the contract and work needed to be completed. If the Engineer deems the project to be on time for

completion then they may contact the Owner and the Funding Agency via email requesting a relief from this clause.

ii. When contract time has been completed and the project is not substantially complete, the Engineer will notify in writing the Surety Company, the Contractor, the Owner, and the Funding Agencies. The letter will notify all parties that Liquidated Damages will be assessed from this point forward until the project has been completed.

iii. If paragraph ii. above is enacted, the Engineer will contact all parties in writing when the project is complete.

47. SUSPENSION OF WORK, TERMINATION, AND DELAY

A. The Owner may suspend the Work or any portion thereof for a period of not more than ninety days or such further time as agreed upon by the Contractor, by Written Notice to the Contractor and the Engineer, which shall fix the date on which Work shall be resumed. The Contractor will be allowed an increase in the Contract Price or an extension of the Contract Time, or both, directly attributable to any suspension.

B. If the Contractor is adjudged to be bankrupt or insolvent, or makes a general assignment for the benefit of his creditors, or if a trustee or receiver is appointed for the Contractor or for any of its property, or if the Contractor files a petition to take advantage of any debtor's act, or to reorganize under the bankruptcy or applicable laws, or repeatedly fails to supply sufficient skilled workmen or suitable materials or equipment, or repeatedly fails to make prompt payments to Subcontractors or for labor, materials, or equipment or disregards laws, ordinances, rules, regulations or orders of any public body having jurisdiction of the Work or disregards the authority of the Engineer, or otherwise violates any provision of the Contract Documents, then the Owner may, without prejudice to any other right or remedy and after giving the Contractor and its surety a minimum of ten days from delivery of a Written Notice, terminate the services of the Contractor and take possession of the Project and of all materials, equipment, tools, construction equipment and machinery thereon owned by the Contractor, and finish the Work by whatever method the Owner may deem expedient. In such case the Contractor shall not be entitled to receive any further payment until the Work is finished. If the unpaid balance of the Contract Price exceeds the direct and indirect costs of completing the Project, including compensation for additional professional services, such excess shall be paid to the Contractor. If such costs exceed such unpaid balance, the Contractor will pay the difference to the Owner. Such costs incurred by the Owner will be determined by the Engineer and incorporated in a Change Order.

C. Where the Contractor’s services have been so terminated by the Owner, said termination shall not affect any right of the Owner against the Contractor then existing or which may thereafter accrue. Any retention or payment of monies by the Owner due the Contractor will not release the Contractor from compliance with the Contract Documents. Upon receipt of a termination action the Contractor shall promptly discontinue all affected work (unless the notice directs otherwise), and deliver or otherwise make available to the Owner all data, drawings, specifications, reports, estimates, summaries and such other information and materials as may have been accumulated by the Contractor in performing this agreement, whether completed or in process.

D. After ten days from delivery of a Written Notice to the Contractor and the Engineer, the Owner may, without cause and with prejudice to any other right or remedy, elect to abandon the Project and terminate the Contract. In such case the Contractor shall be paid for all Work executed and any expense sustained plus reasonable profit.

E. If, through no act or fault of the Contractor, the Work is suspended for a period of more than ninety days by the Owner or under an order of the court or other public authority, or the Engineer fails to act on any request for payment within thirty days after it is submitted, or the Owner fails to pay the Contractor substantially the sum approved by the Engineer or awarded by arbitrators within thirty days of its approval and presentation, then the Contractor may, after ten days from delivery of a Written Notice to the Owner and the Engineer terminate the Contract and recover from the Owner payment for all Work executed and all expenses sustained. In addition and in lieu of terminating the Contract, if the Engineer has failed to act on a request for payment or if the Owner has failed to make any payment as aforesaid, the Contractor may upon ten days written notice to the Owner and the Engineer stop the Work until paid all amounts then due, in which event and upon resumption of the Work Change Orders shall be issued for adjusting the Contract Price or extending the Contract Time or both to compensate for the costs and delays attributable to the stoppage of the Work.

F. If the performance of all or any portion of the Work is suspended, delayed, or interrupted as a result of a failure of the Owner or Engineer to act within the time specified in the Contract Documents, or if no time is specified, within a reasonable time, an adjustment in the Contract Price or an extension of the Contract Time, or both, shall be made by Change Order to compensate the Contractor for the costs and delays necessarily caused by the failure of the Owner or Engineer.

48. AS-BUILT DRAWINGS

To assure quality control, the Contractor and the Owner's Inspector shall each maintain a complete set of Plans and Specifications and approved shop drawings at the construction site. In addition, one set of Plans shall be maintained at the site solely for the purpose of marking authorized changes in the plans as the work progresses. These marked up drawings shall be used in the preparation of as-built drawings following project completion and shall be maintained in current condition at all times.

49. GUARANTEE

The Contractor shall guarantee all materials and equipment furnished and Work performed for a period of one year from the date of Substantial Completion. The Contractor warrants and guarantees for a period of one year from the date of Substantial Completion of the system that the completed system is free from all defects due to faulty materials or workmanship and the Contractor shall promptly make such corrections as may be necessary by reason of such defects including the repairs of any damage to other parts of the system resulting from such defects. The Owner will give notice of observed defects with reasonable promptness. In the event that the Contractor should fail to make such repairs, adjustments, or other Work that may be made necessary by such defects, the Owner

may do so and charge the Contractor the cost thereby incurred. The Performance Bond shall remain in full force and effect through the guarantee period.

50. PATENTS

The Contractor shall pay all applicable royalties and license fees, and shall defend all suits or claims for infringement of any patent rights and save the Owner harmless from loss on account thereof, except that the Owner shall be responsible for any such loss when a particular process, design, or product of a particular manufacturer or manufacturers is specified, however, if the Contractor has reason to believe that the design, process or product specified is an infringement of a patent, the Contractor shall be responsible for such loss unless the Contractor promptly gives such information to the Engineer.

51. CONFLICTS OF INTEREST

No official of the Owner who is authorized in such capacity and on behalf of the "Owner" to negotiate, make, accept or approve, or to take part in negotiating, making, accepting, or approving any architectural, engineering, inspection, construction or material supply contract or any subcontract in connection with the construction of the project, shall become directly or indirectly interested personally in this contract or in any part thereof. No officer, employee, architect, attorney, engineer or inspector of or for the "Owner" who is authorized in such capacity and on behalf of the "Owner" who is in any legislative, executive, supervisory, or other similar functions in connection with the construction of the project, shall become directly or indirectly interested personally in this contract or in any part thereof, any material supply contract, subcontract, insurance contract, or any other contract pertaining to the project.

52. ARBITRATION BY MUTUAL AGREEMENT

A. All claims, disputes, and other matters in question arising out of, or relating to, the Contract Documents or the breach thereof, except for claims which have been waived by making an acceptance of final payment as provided by Section 36 and 37, may be decided by arbitration if the parties mutually agree. Any agreement to arbitrate shall be specifically enforceable under the prevailing arbitration law. The award rendered by the arbitrators shall be final, and judgment may be entered upon it in any court having jurisdiction thereof.

B. Notice of the request for arbitration shall be filed in writing with the other party to the Contract Documents and a copy shall be filed with the Engineer. Request for arbitration shall in no event be made on any claim, dispute, or other matter in question which would be barred by the applicable statute of limitations.

C. The Contractor shall diligently pursue the completion of the work during any arbitration or court proceeding unless the work is suspended by the Owner or the contract terminated under the provisions of the Contract Documents.

53. GRATUITIES

If the Owner finds after a notice and hearing that the Contractor or any of the Contractor's agents or representatives offered or gave gratuities (in the form of entertainment, gifts or otherwise) to any official, employee or agent of the Owner, or the State, in an attempt to

secure an agreement or favorable treatment in awarding, amending or making any determinations related to the performance of this agreement, the Owner may, by written notice to the Contractor, terminate this agreement. The Owner may also pursue other rights and remedies that the law or this agreement provides. However, the existence of the facts on which the Owner bases such findings shall be at issue and may be reviewed in proceedings under the Disputes and Remedies section of these Supplemental General Conditions.

54. PROHIBITION ON CERTAIN TELECOMMUNICATION AND VIDEO SURVEILLANCE SERVICES OR EQUIPMENT

The Contractor and all subcontractors awarded subcontracts must comply with regulations at 2 CFR 200.216, *Prohibition on certain telecommunication and video surveillance services or equipment*, implementing section 889 of Public Law 115-232. The regulation prohibits the use of federal funds to procure, enter into, extend, or renew contracts, or obtain equipment, systems, or services that use "covered telecommunications equipment or services" identified in the regulation as a substantial or essential component of any system, or as critical technology as part of any system. The Contractor hereby represents and warrants to and for the benefit of the Owner and the Commission that: (a) the Contractor has reviewed and understands the prohibition on certain telecommunication and video surveillance services, or equipment (the "Prohibition Requirement") and (b) the Contractor will provide verified information, certification or assurance of compliance with this paragraph, or information necessary to support the Prohibition Requirement. Notwithstanding any other provision of this Agreement, any failure to comply with this paragraph by the Contractor shall permit the Owner or Commission to recover as damages against the Contractor for any loss, expense, or cost including, without limitation, attorney's fees, incurred by the Owner or Commission resulting from any such failure including, without limitation, any impairment or loss of funding, whether in whole or in part, from the Commission or any damages owed to the Commission by the Owner. While the Contractor has no direct contractual privity with the Commission, the Owner and the Contractor agree that the Commission is a third-party beneficiary and neither this paragraph nor any other provision of this Agreement necessary to give this paragraph force or effect, shall be amended or waived without the prior written consent of the Commission. A copy of the EPA Memorandum implementing the Prohibition Requirement is attached as Appendix E to these Supplemental General Conditions.

Appendix A.

United States Environmental Protection Agency
Washington, DC 20460

Labor Standards Provisions for
Federally Assisted Contracts

Davis-Bacon and Related Acts

ATTACHMENT 1

CWSRF: The recipient agrees to include in all agreements to provide assistance for the construction of treatment works carried out in whole or in part with such assistance made available by a State water pollution control revolving fund as authorized by title VI of the Federal Water Pollution Control Act (33 U.S.C. 1381 et seq.), or with such assistance made available under section 205(m) of that Act (33 U.S.C. 1285(m)), or both, a term and condition requiring compliance with the requirements of section 513 of that Act (33 U.S.C. 1372) in all procurement contracts and sub-grants, and require that loan recipients, procurement contractors and sub-grantees include such a term and condition in subcontracts and other lower tiered transactions. All contracts and subcontracts for the construction of treatment works carried out in whole or in part with assistance made available as stated herein shall insert in full in any contract in excess of $2,000 the contract clauses as attached hereto entitled "Wage Rate Requirements Under The Consolidated and Further Continuing Appropriations Act, 2013 (P.L. 113-6)." This term and condition applies to all agreements to provide assistance under the authorities referenced herein, whether in the form of a loan, bond purchase, grant, or any other vehicle to provide financing for a project, where such agreements are executed on or after October 30, 2009.

DWSRF: The recipient agrees to include in all agreements to provide assistance for any construction project carried out in whole or in part with such assistance made available by a drinking water revolving loan fund as authorized by section 1452 of the Safe Drinking Water Act (42 U.S.C. 300j-12), a term and condition requiring compliance with the requirements of section 1450(e) of the Safe Drinking Water Act (42 U.S.C.300j-9(e)) in all procurement contracts and sub-grants, and require that loan recipients, procurement contractors and sub-grantees include such a term and condition in subcontracts and other lower tiered transactions All contracts and subcontracts for any construction project carried out in whole or in part with assistance made available as stated herein shall insert in full in any contract in excess of $2,000 the contract clauses as attached hereto entitled "Wage Rate Requirements Under The Consolidated and Further Continuing Appropriations Act, 2013 (P.L. 113-6)." This term and condition applies to all agreements to provide assistance under the authorities referenced herein, whether in the form of a loan, bond purchase, grant, or any other vehicle to provide financing for a project, where such agreements are executed on or after October 30, 2009.

ATTACHMENT 2

Wage Rate Requirements
Under The Consolidated and Further Continuing Appropriations Act, 2013 (P.L. 113-6)

With respect to the Clean Water and Safe Drinking Water State Revolving Funds, EPA provides capitalization grants to each State which in turn provides subgrants or loans to eligible entities within the State. Typically, the subrecipients are municipal or other local governmental entities that manage the funds. For these types of recipients, the provisions set forth under Roman Numeral I, below, shall apply. Although EPA and the State remain responsible for ensuring subrecipients' compliance with the wage rate requirements set forth herein, those subrecipients shall have the primary responsibility to maintain payroll records as described in Section 3(ii)(A), below and for compliance as described in Section I-5.

Occasionally, the subrecipient may be a private for profit or not for profit entity. For these types of recipients, the provisions set forth in Roman Numeral II, below, shall apply. Although EPA and the State remain responsible for ensuring subrecipients' compliance with the wage rate requirements set forth herein, those subrecipients shall have the primary responsibility to maintain payroll records as described in Section II-3(ii)(A), below and for compliance as described in Section II-5.

I. Requirements Under The Consolidated and Further Continuing Appropriations Act, 2013 (P.L. 113-6) for Subrecipients That Are Governmental Entities:

The following terms and conditions specify how recipients will assist EPA in meeting its Davis-Bacon (DB) responsibilities when DB applies to EPA awards of financial assistance under the FY 2013 Continuing Resolution with respect to State recipients and subrecipients that are governmental entities. If a subrecipient has questions regarding when DB applies, obtaining the correct DB wage determinations, DB provisions, or compliance monitoring, it may contact the State recipient. If a State recipient needs guidance, the recipient may contact Lorraine Fleury at fleury.lorraine@epa.gov or at 215-814-2341 of EPA, Region III Grants and Audit Management Branch for guidance. for guidance. The recipient or subrecipient may also obtain additional guidance from DOL's web site at http://www.dol.gov/whd/

1. Applicability of the Davis-Bacon (DB) prevailing wage requirements.
   Under the FY 2013 Continuing Resolution, DB prevailing wage requirements apply to the construction, alteration, and repair of treatment works carried out in whole or in part with assistance made available by a State water pollution control revolving fund and to any construction project carried out in whole or in part by assistance made available by a drinking water treatment revolving loan fund. If a subrecipient encounters a unique situation at a site that presents uncertainties regarding DB applicability, the subrecipient must discuss the situation with the recipient State before authorizing work on that site.

2. Obtaining Wage Determinations.
   (a) Subrecipients shall obtain the wage determination for the locality in which a covered activity subject to DB will take place prior to issuing requests for bids, proposals, quotes

or other methods for soliciting contracts (solicitation) for activities subject to DB. These wage determinations shall be incorporated into solicitations and any subsequent contracts. Prime contracts must contain a provision requiring that subcontractors follow the wage determination incorporated into the prime contract.

(i) While the solicitation remains open, the subrecipient shall monitor www.wdol.gov weekly to ensure that the wage determination contained in the solicitation remains current. The subrecipients shall amend the solicitation if DOL issues a modification more than 10 days prior to the closing date (i.e. bid opening) for the solicitation. If DOL modifies or supersedes the applicable wage determination less than 10 days prior to the closing date, the subrecipients may request a finding from the State recipient that there is not a reasonable time to notify interested contractors of the modification of the wage determination. The State recipient will provide a report of its findings to the subrecipient.

(ii) If the subrecipient does not award the contract within 90 days of the closure of the solicitation, any modifications or supersedes DOL makes to the wage determination contained in the solicitation shall be effective unless the State recipient, at the request of the subrecipient, obtains an extension of the 90 day period from DOL pursuant to 29 CFR 1.6(c)(3)(iv). The subrecipient shall monitor www.wdol.gov on a weekly basis if it does not award the contract within 90 days of closure of the solicitation to ensure that wage determinations contained in the solicitation remain current.

(b) If the subrecipient carries out activity subject to DB by issuing a task order, work assignment or similar instrument to an existing contractor (ordering instrument) rather than by publishing a solicitation, the subrecipient shall insert the appropriate DOL wage determination from www.wdol.gov into the ordering instrument.

(c) Subrecipients shall review all subcontracts subject to DB entered into by prime contractors to verify that the prime contractor has required its subcontractors to include the applicable wage determinations.

(d) As provided in 29 CFR 1.6(f), DOL may issue a revised wage determination applicable to a subrecipient's contract after the award of a contract or the issuance of an ordering instrument if DOL determines that the subrecipient has failed to incorporate a wage determination or has used a wage determination that clearly does not apply to the contract or ordering instrument. If this occurs, the subrecipient shall either terminate the contract or ordering instrument and issue a revised solicitation or ordering instrument or incorporate DOL's wage determination retroactive to the beginning of the contract or ordering instrument by change order. The subrecipient's contractor must be compensated for any increases in wages resulting from the use of DOL's revised wage determination.

3. Contract and Subcontract provisions.

(a) The Recipient shall insure that the subrecipient(s) shall insert in full in any contract in excess of $2,000 which is entered into for the actual construction, alteration and/or repair, including painting and decorating, of a treatment work under the CWSRF or a construction project under the DWSRF financed in whole or in part from Federal funds or in accordance with guarantees of a Federal agency or financed from funds obtained by pledge of any

contract of a Federal agency to make a loan, grant or annual contribution (except where a different meaning is expressly indicated), and which is subject to the labor standards provisions of any of the acts listed in § 5.1 or the FY 2013 Continuing Resolution, the following clauses:

(1) Minimum wages.

(i) All laborers and mechanics employed or working upon the site of the work will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics.

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph (a)(1)(iv) of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in § 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided that the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under paragraph (a)(1)(ii) of this section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

Subrecipients may obtain wage determinations from the U.S. Department of Labor’s web site, www.dol.gov.

(ii) (A) The subrecipient(s), on behalf of EPA, shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The State award official shall approve a request for an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

(1) The work to be performed by the classification requested is not performed by a classification in the wage determination; and
(2) The classification is utilized in the area by the construction industry; and
(3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(B) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the subrecipient(s) agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), documentation of the action taken and the request, including the local wage determination shall be sent by the subrecipient (s) to the State award official. The State award official will transmit the request, to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210 and to the EPA DB Regional Coordinator concurrently. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification request within 30 days of receipt and so advise the State award official or will notify the State award official within the 30-day period that additional time is necessary.

(C) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the subrecipient(s) do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the award official shall refer the request and the local wage determination, including the views of all interested parties and the recommendation of the State award official, to the Administrator for determination. The request shall be sent to the EPA DB Regional Coordinator concurrently. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt of the request and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(D) The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs (a)(1)(ii)(B) or (C) of this section, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

(iii) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(iv) If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits

under a plan or program, Provided, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

(2) Withholding.
The subrecipient(s), shall upon written request of the EPA Award Official or an authorized representative of the Department of Labor, withhold or cause to be withheld from the contractor under this contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the (Agency) may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

(3) Payrolls and basic records.

(i) Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

(ii) (A) The contractor shall submit weekly, for each week in which any contract work is performed, a copy of all payrolls to the subrecipient, that is, the entity that receives the sub-grant or loan from the State capitalization grant recipient. Such

documentation shall be available on request of the State recipient or EPA. As to each payroll copy received, the subrecipient shall provide written confirmation in a form satisfactory to the State indicating whether or not the project is in compliance with the requirements of 29 CFR 5.5(a)(1) based on the most recent payroll copies for the specified week. The payrolls shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on the weekly payrolls. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at http://www.dol.gov/whd/forms/wh347instr.htm or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the subrecipient(s) for transmission to the State or EPA if requested by EPA , the State, the contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the subrecipient(s).

(B) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(1) That the payroll for the payroll period contains the information required to be provided under § 5.5 (a)(3)(ii) of Regulations, 29 CFR part 5, the appropriate information is being maintained under § 5.5 (a)(3)(i) of Regulations, 29 CFR part 5, and that such information is correct and complete;
(2) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR part 3;
(3) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(C) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for

submission of the "Statement of Compliance" required by paragraph (a)(3)(ii)(B) of this section.

(D) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under section 1001 of title 18 and section 231 of title 31 of the United States Code.

(iii) The contractor or subcontractor shall make the records required under paragraph (a)(3)(i) of this section available for inspection, copying, or transcription by authorized representatives of the State, EPA or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the Federal agency or State may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

(4) Apprentices and trainees,

(i) Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the

apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(ii) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(iv) Equal employment opportunity. The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended and 29 CFR part 30.

(5) Compliance with Copeland Act requirements. The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract.

(6) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses contained in 29 CFR 5.5(a)(1) through (10) and such other clauses as the EPA determines may by appropriate, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.

(7) Contract termination; debarment. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

(8) Compliance with Davis-Bacon and Related Act requirements. All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract.

(9) Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and Subrecipient(s), State, EPA, the U.S. Department of Labor, or the employees or their representatives.

(10) Certification of eligibility.

(i) By entering into this contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(ii) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(iii) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

4. Contract Provision for Contracts in Excess of $100,000.
   (a) Contract Work Hours and Safety Standards Act. The subrecipient shall insert the following clauses set forth in paragraphs (a)(1), (2), (3), and (4) of this section in full in any contract in an amount in excess of $100,000 and subject to the overtime provisions of the Contract Work Hours and Safety Standards Act. These clauses shall be inserted in addition to the clauses required by Item 3, above or 29 CFR 4.6. As used in this paragraph, the terms laborers and mechanics include watchmen and guards.

   (1) Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

   (2) Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph (a)(1) of this section the contractor and any subcontractor responsible therefore shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (a)(1) of this section, in the sum of $10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (a)(1) of this section.

   (3) Withholding for unpaid wages and liquidated damages. The subrecipient**,** upon written request of the EPA Award Official or an authorized representative of the Department of Labor, shall withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (b)(2) of this section.

   (4) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (a)(1) through (4) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (a)(1) through (4) of this section.

(b) In addition to the clauses contained in Item 3, above, in any contract subject only to the Contract Work Hours and Safety Standards Act and not to any of the other statutes cited in 29 CFR 5.1, the Subrecipient shall insert a clause requiring that the contractor or subcontractor shall maintain payrolls and basic payroll records during the course of the work and shall preserve them for a period of three years from the completion of the contract for all laborers and mechanics, including guards and watchmen, working on the contract. Such records shall contain the name and address of each such employee, social security number, correct classifications, hourly rates of wages paid, daily and weekly number of hours worked, deductions made, and actual wages paid. Further, the Subrecipient shall insert in any such contract a clause providing hat the records to be maintained under this paragraph shall be made available by the contractor or subcontractor for inspection, copying, or transcription by authorized representatives of the (write the name of agency) and the Department of Labor, and the contractor or subcontractor will permit such representatives to interview employees during working hours on the job.

5. Compliance Verification

(a) The subrecipient shall periodically interview a sufficient number of employees entitled to DB prevailing wages (covered employees) to verify that contractors or subcontractors are paying the appropriate wage rates. As provided in 29 CFR 5.6(a)(6), all interviews must be conducted in confidence. The subrecipient must use Standard Form 1445 (SF 1445) or equivalent documentation to memorialize the interviews. Copies of the SF 1445 are available from EPA on request.

(b) The subrecipient shall establish and follow an interview schedule based on its assessment of the risks of noncompliance with DB posed by contractors or subcontractors and the duration of the contract or subcontract. Subrecipients must conduct more frequent interviews if the initial interviews or other information indicated that there is a risk that the contractor or subcontractor is not complying with DB.

Subrecipients shall immediately conduct interviews in response to an alleged violation of the prevailing wage requirements. All interviews shall be conducted in confidence."

(c) The subrecipient shall periodically conduct spot checks of a representative sample of weekly payroll data to verify that contractors or subcontractors are paying the appropriate wage rates. The subrecipient shall establish and follow a spot check schedule based on its assessment of the risks of noncompliance with DB posed by contractors or subcontractors and the duration of the contract or subcontract. At a minimum, if practicable, the subrecipient should spot check payroll data within two weeks of each contractor or subcontractor’s submission of its initial payroll data and two weeks prior to the completion date the contract or subcontract . Subrecipients must conduct more frequent spot checks if the initial spot check or other information indicates that there is a risk that the contractor or subcontractor is not complying with DB. In addition, during the examinations the subrecipient shall verify evidence of fringe benefit plans and payments there under by contractors and subcontractors who claim credit for fringe benefit contributions.

(d) The subrecipient shall periodically review contractors and subcontractors use of apprentices and trainees to verify registration and certification with respect to apprenticeship and training programs approved by either the U.S Department of Labor or a state, as appropriate, and that contractors and subcontractors are not using disproportionate numbers of, laborers, trainees and apprentices. These reviews shall be conducted in accordance with the schedules for spot checks and interviews described in Item 5(b) and (c) above.

(e) Subrecipients must immediately report potential violations of the DB prevailing wage requirements to the EPA DB contact listed above and to the appropriate DOL Wage and Hour District Office listed at http://www.dol.gov/contacts/whd/america2.htm.

II. Requirements Under The Consolidated and Further Continuing Appropriations Act, 2013 (P.L. 113-6) for Subrecipients That Are Not Governmental Entities:

The following terms and conditions specify how recipients will assist EPA in meeting its DB responsibilities when DB applies to EPA awards of financial assistance under the FY2013 Continuing Resolution with respect to subrecipients that are not governmental entities. If a subrecipient has questions regarding when DB applies, obtaining the correct DB wage determinations, DB provisions, or compliance monitoring, it may contact the State recipient for guidance. If a State recipient needs guidance, the recipient may contact Julie Milazzo at Milazzo.julie@epa.gov or at 415-972-3687, EPA Grants Management Office for guidance. The recipient or subrecipient may also obtain additional guidance from DOL's web site at http://www.dol.gov/whd/

Under these terms and conditions, the subrecipient must submit its proposed DB wage determinations to the State recipient for approval prior to including the wage determination in any solicitation, contract task orders, work assignments, or similar instruments to existing contractors.

1. Applicability of the Davis- Bacon (DB) prevailing wage requirements.
   Under the FY 2013 Continuing Resolution, DB prevailing wage requirements apply to the construction, alteration, and repair of treatment works carried out in whole or in part with assistance made available by a State water pollution control revolving fund and to any construction project carried out in whole or in part by assistance made available by a drinking water treatment revolving loan fund. If a subrecipient encounters a unique situation at a site that presents uncertainties regarding DB applicability, the subrecipient must discuss the situation with the recipient State before authorizing work on that site.

2. Obtaining Wage Determinations.
   (a) Subrecipients must obtain proposed wage determinations for specific localities at www.wdol.gov. After the Subrecipient obtains its proposed wage determination, it must submit the wage determination to the Arkansas Natural Resources Commission's Water Resource Development Division for approval prior to inserting the wage determination into a solicitation, contract or issuing task orders, work assignments or similar instruments to

existing contractors (ordering instruments unless subsequently directed otherwise by the State recipient Award Official.

(b) Subrecipients shall obtain the wage determination for the locality in which a covered activity subject to DB will take place prior to issuing requests for bids, proposals, quotes or other methods for soliciting contracts (solicitation) for activities subject to DB. These wage determinations shall be incorporated into solicitations and any subsequent contracts. Prime contracts must contain a provision requiring that subcontractors follow the wage determination incorporated into the prime contract.

(i) While the solicitation remains open, the subrecipient shall monitor www.wdol.gov. on a weekly basis to ensure that the wage determination contained in the solicitation remains current. The subrecipients shall amend the solicitation if DOL issues a modification more than 10 days prior to the closing date (i.e. bid opening) for the solicitation. If DOL modifies or supersedes the applicable wage determination less than 10 days prior to the closing date, the subrecipients may request a finding from the State recipient that there is not a reasonable time to notify interested contractors of the modification of the wage determination. The State recipient will provide a report of its findings to the subrecipient.

(ii) If the subrecipient does not award the contract within 90 days of the closure of the solicitation, any modifications or supersedes DOL makes to the wage determination contained in the solicitation shall be effective unless the State recipient, at the request of the subrecipient, obtains an extension of the 90 day period from DOL pursuant to 29 CFR 1.6(c)(3)(iv). The subrecipient shall monitor www.wdol.gov on a weekly basis if it does not award the contract within 90 days of closure of the solicitation to ensure that wage determinations contained in the solicitation remain current.

(c) If the subrecipient carries out activity subject to DB by issuing a task order, work assignment or similar instrument to an existing contractor (ordering instrument) rather than by publishing a solicitation, the subrecipient shall insert the appropriate DOL wage determination from www.wdol.gov into the ordering instrument.

(d) Subrecipients shall review all subcontracts subject to DB entered into by prime contractors to verify that the prime contractor has required its subcontractors to include the applicable wage determinations.

(e) As provided in 29 CFR 1.6(f), DOL may issue a revised wage determination applicable to a subrecipient's contract after the award of a contract or the issuance of an ordering instrument if DOL determines that the subrecipient has failed to incorporate a wage determination or has used a wage determination that clearly does not apply to the contract or ordering instrument. If this occurs, the subrecipient shall either terminate the contract or ordering instrument and issue a revised solicitation or ordering instrument or incorporate DOL's wage determination retroactive to the beginning of the contract or ordering instrument by change order. The subrecipient's contractor must be compensated for any increases in wages resulting from the use of DOL's revised wage determination.

3. Contract and Subcontract provisions.
   (a) The Recipient shall insure that the subrecipient(s) shall insert in full in any contract in excess of $2,000 which is entered into for the actual construction, alteration and/or repair, including painting and decorating, of a treatment work under the CWSRF or a construction project under the DWSRF financed in whole or in part from Federal funds or in accordance with guarantees of a Federal agency or financed from funds obtained by pledge of any contract of a Federal agency to make a loan, grant or annual contribution (except where a different meaning is expressly indicated), and which is subject to the labor standards provisions of any of the acts listed in § 5.1 or the FY 2013 Continuing Resolution, the following clauses:

   (1) Minimum Wages.
      (i) All laborers and mechanics employed or working upon the site of the work, will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics.

      Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph (a)(1)(iv) of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in § 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, that the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under paragraph (a)(1)(ii) of this section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

      Subrecipients may obtain wage determinations from the U.S. Department of Labor's web site, www.dol.gov. .

(ii) (A) The subrecipient(s), on behalf of EPA, shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The State award official shall approve a request for an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

(1) The work to be performed by the classification requested is not performed by a classification in the wage determination; and

(2) The classification is utilized in the area by the construction industry; and

(3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(B) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the subrecipient(s) agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), documentation of the action taken and the request, including the local wage determination shall be sent by the subrecipient(s) to the State award official. The State award official will transmit the report, to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210 and to the EPA DB Regional Coordinator concurrently. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification request within 30 days of receipt and so advise the State award official or will notify the State award official within the 30-day period that additional time is necessary.

(C) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the and the subrecipient(s) do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the award official shall refer the request, and the local wage determination, including the views of all interested parties and the recommendation of the State award official, to the Administrator for determination. The request shall be sent to the EPA Regional Coordinator concurrently. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt of the request and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(D) The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs (a)(1)(ii)(B) or (C) of this section, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

(iii) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate,

the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(iv) If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, Provided, That the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

(2) Withholding. The subrecipient(s) shall upon written request of the EPA Award Official or an authorized representative of the Department of Labor, withhold or cause to be withheld from the contractor under this contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the (Agency) may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

(3) Payrolls and basic records.

(i) Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of

apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

(ii) (A) The contractor shall submit weekly, for each week in which any contract work is performed, a copy of all payrolls to the subrecipient, that is, the entity that receives the sub-grant or loan from the State capitalization grant recipient. Such documentation shall be available on request of the State recipient or EPA. As to each payroll copy received, the subrecipient shall provide written confirmation in a form satisfactory to the State indicating whether or not the project is in compliance with the requirements of 29 CFR 5.5(a)(1) based on the most recent payroll copies for the specified week. The payrolls shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on the weekly payrolls. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 is available for this purpose from the Wage and Hour Division Web site at http://www.dol.gov/whd/forms/wh347instr.htm or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the subrecipient(s) for transmission to the State or EPA if requested by EPA, the State, the contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the subrecipient(s).

(B) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(1) That the payroll for the payroll period contains the information required to be provided under § 5.5 (a)(3)(ii) of Regulations, 29 CFR part 5, the appropriate information is being maintained under § 5.5 (a)(3)(i) of Regulations, 29 CFR part 5, and that such information is correct and complete;

(2) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR part 3;

(3) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work

performed, as specified in the applicable wage determination incorporated into the contract.

(C) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph (a)(3)(ii)(B) of this section.

(D) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under section 1001 of title 18 and section 231 of title 31 of the United States Code.

(iii) The contractor or subcontractor shall make the records required under paragraph (a)(3)(i) of this section available for inspection, copying, or transcription by authorized representatives of the State, EPA or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the Federal agency or State may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

(4) Apprentices and Trainees

(i) Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates

(expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(ii) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(iv) Equal employment opportunity. The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment

opportunity requirements of Executive Order 11246, as amended and 29 CFR part 30.

(5) Compliance with Copeland Act requirements. The contractor shall comply with the requirements of 29 CFR part 3, which are incorporated by reference in this contract.

(6) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses contained in 29 CFR 5.5(a)(1) through (10) and such other clauses as the EPA determines may by appropriate, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.

(7) Contract termination: debarment. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

(8) Compliance with Davis-Bacon and Related Act requirements. All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract.

(9) Disputes concerning labor standards. Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and Subrecipient(s), State, EPA, the U.S. Department of Labor, or the employees or their representatives.

(10) Certification of eligibility.

(i) By entering into this contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(ii) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(iii) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

4. Contract Provision for Contracts in Excess of $100,000.

(a) Contract Work Hours and Safety Standards Act. The subrecipient shall insert the following clauses set forth in paragraphs (a)(1), (2), (3), and (4) of this section in full in any contract in an amount in excess of $100,000 and subject to the overtime provisions of the Contract

Work Hours and Safety Standards Act. These clauses shall be inserted in addition to the clauses required by Item 3, above or 29 CFR 4.6. As used in this paragraph, the terms laborers and mechanics include watchmen and guards.

(1) Overtime requirements. No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

(2) Violation; liability for unpaid wages; liquidated damages. In the event of any violation of the clause set forth in paragraph (b)(1) of this section the contractor and any subcontractor responsible therefore shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (b)(1) of this section, in the sum of $10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (b)(1) of this section.

(3) Withholding for unpaid wages and liquidated damages. The subrecipient shall upon the request of the EPA Award Official or an authorized representative of the Department of Labor, withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (a)(2) of this section.

(4) Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (b)(1) through (4) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (b)(1) through (4) of this section.

(b) In addition to the clauses contained in Item 3, above, in any contract subject only to the Contract Work Hours and Safety Standards Act and not to any of the other statutes cited in 29 CFR 5.1, the Subrecipient shall insert a clause requiring that the contractor or subcontractor shall maintain payrolls and basic payroll records during the course of the work and shall preserve them for a period of three years from the completion of the contract for all laborers and mechanics, including guards and watchmen, working on the contract.

Such records shall contain the name and address of each such employee, social security number, correct classifications, hourly rates of wages paid, daily and weekly number of hours worked, deductions made, and actual wages paid. Further, the Subrecipient shall insert in any such contract a clause providing that the records to be maintained under this paragraph shall be made available by the contractor or subcontractor for inspection, copying, or transcription by authorized representatives of the (write the name of agency) and the Department of Labor, and the contractor or subcontractor will permit such representatives to interview employees during working hours on the job.

5. Compliance Verification
   (a) The subrecipient shall periodically interview a sufficient number of employees entitled to DB prevailing wages (covered employees) to verify that contractors or subcontractors are paying the appropriate wage rates. As provided in 29 CFR 5.6(a)(6), all interviews must be conducted in confidence. The subrecipient must use Standard Form 1445 (SF 1445) or equivalent documentation to memorialize the interviews. Copies of the SF 1445 are available from EPA on request.

   (b) The subrecipient shall establish and follow an interview schedule based on its assessment of the risks of noncompliance with DB posed by contractors or subcontractors and the duration of the contract or subcontract. Subrecipients must conduct more frequent interviews if the initial interviews or other information indicated that there is a risk that the contractor or subcontractor is not complying with DB. Subrecipients shall immediately conduct interviews in response to an alleged violation of the prevailing wage requirements. All interviews shall be conducted in confidence."

   (c) The subrecipient shall periodically conduct spot checks of a representative sample of weekly payroll data to verify that contractors or subcontractors are paying the appropriate wage rates. The subrecipient shall establish and follow a spot check schedule based on its assessment of the risks of noncompliance with DB posed by contractors or subcontractors and the duration of the contract or subcontract. At a minimum, if practicable the subrecipient should spot check payroll data within two weeks of each contractor or subcontractor's submission of its initial payroll data and two weeks prior to the completion date the contract or subcontract. Subrecipients must conduct more frequent spot checks if the initial spot check or other information indicates that there is a risk that the contractor or subcontractor is not complying with DB. In addition, during the examinations the subrecipient shall verify evidence of fringe benefit plans and payments there under by contractors and subcontractors who claim credit for fringe benefit contributions.

   (d) The subrecipient shall periodically review contractors and subcontractors use of apprentices and trainees to verify registration and certification with respect to apprenticeship and training programs approved by either the U.S Department of Labor or a state, as appropriate, and that contractors and subcontractors are not using disproportionate numbers of, laborers, trainees and apprentices. These reviews shall be conducted in accordance with the schedules for spot checks and interviews described in Item 5(b) and (c) above.

(e) Subrecipients must immediately report potential violations of the DB prevailing wage requirements to the EPA DB contact listed above and to the appropriate DOL Wage and Hour District Office listed at http://www.dol.gov/whd/america2.htm.

Appendix B.

Rules and Regulations

Title 41- Public Contract and Property Management

Chapter 60 - Office of Federal Contract Compliance Programs, Equal Employment Opportunity, Department of Labor

Compliance Responsibility for Equal Employment Opportunity

Final Rule

Part 60-1 Obligations of Contractors and Sub-Contractors

§60-1.4 Equal Opportunity Clause

(a) FEDERALLY ASSISTED CONSTRUCTION CONTRACTS (1) Except as otherwise provided, each administering agency shall require the inclusion of the following language as a condition of any grant, contract, loan, insurance, or guarantee involving federally assisted construction which is not exempt from the requirements of the equal opportunity clause:

The applicant hereby agrees that it will incorporate or cause to be incorporated into any contract for construction work, or modification thereof, as defined in the regulations of the Secretary of Labor at 41 CFR Chapter 60, which is paid for in whole or in part with funds obtained from the Federal Government or borrowed on the credit of the Federal Government pursuant to a grant, contract, loan insurance, or guarantee, or undertaken pursuant to any Federal program involving such grant, contract, loan, insurance, or guarantee, the following equal opportunity clause:

During the performance of this contract, the contractor agrees as follows:

(2) The contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. The contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, color, religion, sex, or national origin, such action shall include, but not be limited to the following: Employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other form of compensation; and selection for training, including apprenticeship. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this nondiscrimination clause.

(3) The contractor will, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive considerations for employment without regard to race, color, religion, sex, or national origin.

(4) The contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice to be provided advising the said labor union or workers' representatives of the contractor's commitments under this section, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

(5) The contractor will comply with all provisions of Executive Order 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.

(6) The contractor will furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by rules, regulations, and orders of the Secretary of Labor, his books, records, and accounts by the administering agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

(7) In the event of the contractor's non-compliance with the nondiscrimination clauses of this contract or with any of the said rules, regulations, or orders, this contract may be canceled, terminated, or suspended in whole or in part and the contractor may be declared ineligible for further Government contracts or federally assisted construction contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

(8) The contractor will include the portion of the sentence immediately preceding paragraph (1) and the provisions of paragraphs (1) through (7) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The contractor will take such action with respect to any subcontract or purchase order as the administering agency may direct as a means of enforcing such provisions, including sanctions for noncompliance: PROVIDED, HOWEVER. That in the event a contractor becomes involved in or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the administering agency the contractor may request the United States to enter into such litigation to protect the interest of the United States.

The applicant further agrees that it will be bound by the above equal opportunity clause with respect to its own employment practices when it participates in federally assisted construction work: PROVIDED, That if the applicant so participating is a State or local government, the above equal opportunity clause is not applicable to any agency, instrumentality or subdivision of such government which does not participate in work on or under the contract.

The applicant agrees that it will assist and cooperate actively with the administering. agency and the Secretary of Labor in obtaining the compliance of contractors and subcontractors with the equal opportunity clause and the rules, regulations, and relevant orders of the Secretary of Labor, that it will furnish the administering agency and the Secretary of Labor such information as they may require for the supervision of such compliance, and that it will otherwise assist the administering agency in the discharge of the agency's primary responsibility for securing compliances.

The applicant further agrees that it will refrain from entering into any contract or contract modification subject to Executive Order 11246 of September 24, 1965, with a contractor debarred from, or who has not demonstrated eligibility for, Government contracts and federally assisted construction contracts pursuant to the Executive order and will carry out such sanctions and penalties for violation of the equal opportunity clause as may be imposed upon contractors and subcontractors by the administering agency or the Secretary of Labor pursuant to Part II, Subpart D of the Executive order. In addition, the applicant agrees that if it fails or refuses to comply with these undertakings, the administering agency may take any or all of the following actions: Cancel, terminate, or suspend in whole or in part this grant (contract, loan, insurance, guarantee): refrain from extending any further assistance to the applicant under the program with respect to which the failure or refund occurred until satisfactory assurance of future compliance has been received from such applicant; and refer the case to the Department of Justice for appropriate legal proceedings.

(b) SUBCONTRACTS. Each nonexempt prime contractor or subcontractor shall include the equal opportunity clause in each of its nonexempt subcontracts.

(c) INCORPORATION BY REFERENCE. The equal opportunity clause may be incorporated by reference in all Government contracts and subcontracts, including Government bills of lading, transportation requests, contracts for deposit of Government funds, and contracts for issuing and paying U.S. savings bonds and notes, and such other contracts and subcontracts as the director may designate.

(d) INCORPORATION BY OPERATION OF THE ORDER. By operation of the Order, the equal opportunity clause shall be considered to be a part of every contract and subcontract required by the Order and the regulations in this part to include such a clause whether or not it is physically incorporated in such contracts and whether or not the contract between the agency and the contractor is written.

(e) ADAPTATION OF LANGUAGE. Such necessary changes in language may be made in the equal opportunity clause as shall be appropriate to identify properly the parties and their undertakings.

Part 60-4 - Construction Contractors - Affirmative Action Requirements
§60-4.2 Solicitations.

(a) All Federal contracting officers and all applicants shall include the notice set forth in paragraph (d) of this section and the Standard Federal Equal Employment Opportunity Construction Contract Specifications set forth in §60-4.3 of this part in all solicitations for offers and bids on all Federal and federally assisted construction contracts or subcontracts to be performed in geographical areas designated by the Director pursuant to §60-4.6 of the part. Administering agencies shall require the inclusion of the notice set forth in paragraph (d) of this section and the specifications set forth in §60-4.3 of this part as a condition of any grant, contract, subcontract, loan, insurance or guarantee involving federally assisted construction covered by this part 60-4.

(b) All nonconstruction contractors covered by Executive Order 11246 and the implementing regulations shall include the notice in paragraph (d) of this section in all construction agreements which are necessary in whole or in part to the performance of the covered nonconstruction contract.

(c) Contracting officers, applicants and nonconstruction contractors shall give (SIC) written notice to the Director within 10 working days of award of a contract subject to these provisions. The notification shall include the name, address and telephone number of the contractor; employer identification number; dollar amount of the contract, estimated starting and completion dates of the contract; the contract number; and geographical area in which the contract is to be performed.

(d) The following notice shall be included in, and shall be a part of, all solicitations for offers and bids on all Federal and federally assisted construction contracts or subcontracts in excess of $10,000 to be performed in geographical areas designed by the Director pursuant to §60-4.5 of this part (see 4) CFR 60-4.2 (a)):

NOTICE OF REQUIREMENT FOR AFFIRMATIVE ACTION TO ENSURE EQUAL EMPLOYMENT OPPORTUNITY (EXECUTIVE ORDER 11246)

(1) The Offeror’s or Bidder’s attention is called to the “Equal Opportunity Clause” and the “Standard Federal Equal Employment Specifications” set forth herein.

(2) The goals and timetables for minority and female participation, expressed in percentage terms for the Contractor's aggregate work force in each trade on all construction work in the covered area, are as follows:

Time Tables	Goals for minority participation for each trade Insert goals for each year.	Goals for female participation in each trade Insert goals for each year.

These goals are applicable to all the Contractor's construction work (whether or not it is Federal or federally assisted) performed in the covered area. If the contractor performs construction work in a geographical area located outside of the covered area, it shall apply the goals established for such geographical area where the work is actually performed, with regard to this second area, the contractor also is subject to the goals for both its federally involved and nonfederally involved construction.

The Contractor's compliance with the Executive Order and the regulations in 41 CFR Part 60-4 shall be based on its implementation of the Equal Opportunity Clause, specific affirmative action obligations required by the specification set forth in 41 CFR 60-4.3 (a), and its efforts to meet the goals. The hours of minority and female employment and training must be substantially uniform throughout the length of the contract, and in each trade, and the contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from Contractor to Contractor or from project to project for the sole purpose of the meeting the Contractor's goals shall be a violation of the contract, the Executive Order and the regulations in 41 CFR part 60-4, Compliance with the goals will be measured against the total work hours performed.

(3) The Contractor shall provide written notification to the Director of the Office of Federal Contract Compliance Programs within 10 working days of award of any construction sub-contract in excess of $10,000 at any tier for construction work under the contract resulting from this solicitation. The notification shall list the name, address and telephone number of the subcontractor; employer identification number; estimated dollar amount of the subcontract ; estimated starting and completion dates of the subcontract; and the geographical area in which the contract is to be performed.

(4) As used in this Notice, and in the contract resulting from this solicitation, the "covered area" is (insert description of the geographical areas where the contract is to be performed giving the state, county and city, if any).

§60-4.3 EQUAL OPPORTUNITY CLAUSES;

(a) The equal opportunity clause published at 41 CFR 60-1.4 (a) of this chapter is required to be included in, and is part of, all nonexempt Federal contracts and subcontracts, including construction contracts and subcontracts. The equal opportunity clause published at 41 CFR 60-1.4 (b) is required to be included in, and is a part of, all nonexempt federally assisted construction contracts and subcontracts. In addition to the clauses described above, all Federal contracting officers, all applicants and all nonconstruction contractors as applicable, shall include the specifications set forth in this section in all Federal and federally assisted construction contracts in excess of $10,000 to be performed in geographical areas designated by the Director pursuant to §60-4.6 of this part and in construction subcontracts in excess of $10,000 necessary in whole or in

part to the performance of non-construction Federal contracts and subcontracts covered under the Executive Order.

STANDARD FEDERAL EQUAL EMPLOYMENT OPPORTUNITY CONSTRUCTION CONTRACT SPECIFICATIONS (EXECUTIVE ORDER 11246)

(1) As used in these specifications:
   a. "Covered area" means the geographical area described in the solicitation from which this contract resulted:
   b. "Director" means Director, Office of Federal Contracts Compliance Programs, United States Department of Labor, or any person to who the Director delegates authority:
   c. "Employer identification number" means the Federal Social Security number used on the Employer' s Quarterly Federal Tax Return, U.S. Treasury Department Form 941.
   d. "Minority" includes:
      (i) Black (all persons having origins in any of the Black African racial groups not of Hispanic origin);
      (ii) Hispanic (all persons of Mexican, Puerto Rican, Cuban, Central or South American or other Spanish Culture or origin, regardless or race);
      (iii) Asian and Pacific Islander (all persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian Subcontinent, or the Pacific Islands): and
      (iv) American Indian or Alaskan Native (all persons having origins in any of the original peoples of North America and maintaining identifiable tribal affiliations through membership and participation or community identification).

(2) Whenever the Contractor, or any Subcontractor at any tier, subcontracts a portion of the work involving any construction trade, it shall physically include in each subcontract in excess of $10,000 the provisions of these specifications and the Notice which contains the applicable goals for minority and female participation and which a set forth in the solicitations from which this contract resulted.

(3) If the Contractor is participating (pursuant to 41 CFR 60-4.5) in a Hometown Plan approved by the U.S. Department of Labor in the covered area either individually or through an association, its affirmative action obligations on all work in the Plan area (including goals and timetables) shall be in accordance with that Plan for those trades which have unions participating in the Plan. Contractors must be able to demonstrate, their participation in and compliance with the provisions of any such Hometown Plan. Each Contractor or Subcontractor participating in a approved Plan is individually required to comply with its obligations under the EEO clause, and to make a good faith effort to achieve each goal under the Plan in each trade in which it has employees. The overall good faith performance by other Contractors or Subcontractors toward a goal in an approved Plan does not excuse any covered Contractor's or Subcontractor's failure to take good faith efforts to achieve the Plan goals and timetables.

(4) The Contractor shall implement the specific affirmative action standards provided in paragraphs 7a through p of these specifications. The goals set forth in the solicitation from which this contract resulted are expressed as percentages of the total hours of employment and training of minority and female utilization the

Contractor should reasonably be able to achieve in each construction trade in which it has employees in the covered area. Covered construction contractors performing construction work in geographical areas where they do not have a Federal of federally assisted construction contract shall apply the minority and female goals established for the geographical area where the work is being performed. Goals are published periodically in the Federal Register in notice form, and such notices may be obtained from any Office of Federal Contract Compliance Programs office or from Federal procurement contracting officers. The contractor is expected to make substantially uniform progress in meeting the goals in each craft during the period specified.

(5) Neither the provisions of any collective bargaining agreement, or the failure by a union with whom the Contractor has a collective bargaining agreement, to refer either minorities or women shall excuse the Contractor's obligations under these specifications. Executive Order 11246, or the regulations promulgated pursuant thereto.

(6) In order for the non-working training hours of apprentices and trainees to be counted in meeting the goals, such apprentices and trainees must be employed by the Contractor during the training period, and the Contractor must have made a commitment to employ the apprentices and trainees at the completion of their training, subject to the availability of employment opportunities. The trainees must be trained pursuant to training programs approved by the U.S. Department of Labor.

(7) The Contractor shall take specific affirmative actions to ensure equal employment opportunity. The evaluation of the Contractor's compliance with these specifications shall be based upon its effort to achieve maximum results from its actions. The Contractor shall document these efforts fully, and shall implement affirmative action steps at least as extensive as the following:

a.. Ensure and maintain a working environment free of harassment, intimidation, and coercion at all sites, and in all facilities at which the Contractor's employees are assigned to work. The Contractor, where possible, will assign two or more women to each construction project. The Contractor shall specifically ensure that all foremen, superintendents, and other on-site supervisory personnel are aware of and carry out the Contractor's obligation to maintain such a working environment, with specific attention to minority or female individuals working at such sites or in such facilities.

b. Establish and maintain a current list of minority and female recruitment sources, provide written notification to minority and female recruitment sources and to community organizations when the Contractor or its unions have employment opportunities available, and maintain a record of the organizations responses.

c. Maintain a current file of the names, addresses and telephone numbers of each minority and female off-the-street applicant and minority or female referral from a union, a recruitment source or community organization and of what action was taken with respect to each such individual. If such individual was sent to the union hiring hall for referral and was not referred back to the Contractor by the union or, if referred, not employed by the Contractor, this shall be documented in the file with the reason therefore, along with what-ever additional actions the Contractor may have taken.

d. Provide immediate written notification to the Director when the union or unions with which the Contractor has a collective bargaining agreement has not referred to the Contractor a minority person or woman sent by the

Contractor, or when the Contractor has other information that the union referral process has impeded the Contractor's efforts to meets its obligations.

e. Develop on-the-job training opportunities and/or participate in training programs for the area which expressly include minorities and women, including upgrading programs and apprenticeship and trainee programs relevant to the Contractor's employment needs, especially those programs funded or approved by the Department of Labor. The Contractor shall provide notice of these programs to the sources complied under 7b above.

f. Disseminate the Contractor's EEO policy by providing notice of the policy by providing notice of the policy to unions and training programs and requesting their cooperation in assisting the Contractor in meeting its EEO obligations; by including it in any policy manual and collective bargaining agreement; by publicizing it in the company newspaper, annual report, etc.; by specific review of the policy with all management personnel and with all minority and female employees at least once a year; and by posting the company EEO policy on bulletin boards accessible to all employees at each location where construction work is performed.

g. Review, at least annually, the company's EEO policy and affirmative action obligations under these specifications with all employees having any responsibility for hiring, assignment, layoff, termination or other employment decisions including specific review of these items with onsite supervisory personnel such as Superintendents, General Foremen, etc., prior to the initiation of construction work at any job site. A written record shall be made and maintained identifying the time and place of these meetings, persons attending, subject matter discussed, and disposition of the subject matter.

h Disseminate the Contractor's EEO policy externally by including it in any advertising in the news media, specifically including minority and female new media, and providing written notification to and discussing the Contractor's EEO policy with other Contractors and Subcontractors with who the Contractor does or anticipates doing business.

i. Direct its recruitment efforts, both oral and written, to minority, female and community organizations, to schools with minority and female students and to minority and female recruitment and training organizations serving the Contractor's recruitment area and employment needs. Not later than one month prior to the date for the acceptance of applications for apprenticeship or other training by any recruitment source, the Contractor shall send written notification to organizations such as the above, describing the openings, screening procedures, and tests to be used in the selection process.

j. Encourage present minority and female employees to recruit other minority persons and women and, where reasonable, provide after school, summer and vacation employment to minority and female youth both on the site and in other areas of a Contractor's work force.

k. Validate all tests and other selection requirements where there is an obligation to do so under 41 CFR part 60-3.

l. Conduct, at least annually, an inventory and evaluation at least of all minority and female personnel for promotional opportunities and encourage these employees to seek or to prepare for, through appropriate training, etc., such opportunities.

m. Ensure that seniority practices, job classifications, work assignments and other personnel practices, do not have a discriminatory effect by continually monitoring all personnel and employment related activities to ensure that

the EEO policy and the Contractor's obligation under these specifications are being carried out.

n. Ensure that all facilities and company activities are nonsegregated except that separate or single-user toilet and necessary changing facilities shall be provided to assure privacy between the sexes.

o. Document and maintain a record of all solicitations of offers for subcontracts from minority and female construction contractors and suppliers, including circulation of solicitations to minority and female contractor associations and other business associations.

p. Conduct a review, at least annually, of all supervisors' adherence to and performance under the Contractor's EEO policies and affirmative action obligations.

(8) Contractors are encouraged to participate in voluntary associations which assist in fulfilling one or more of their affirmative action obligations (7a through p). The efforts of contractor association, joint contractor-union, contractor-community, or other similar group of which the contractor is a member and participating may be asserted as fulfilling any one or more to its obligations under 7a through p of these Specifications provided that the contractor actively participates in the group, makes every effort to assure that the group has a positive impact on the employment of minorities and women in the industry, ensures that the concrete benefits of the program are reflected in the Contractor's minority and female work force participation, makes a good faith effort to meet its individual goals and timetables, and can provide access to documentation which demonstrates the effectiveness of actions taken on behalf to the Contractor. The obligation to comply, however, is the Contractor's and failure of such a group to fulfill an obligation shall not be a defense for the Contractor's noncompliance.

(9) A single goal for minorities and a separate single goal for women have been established. The Contractor, however, is required to provide equal employment opportunity and to take affirmative action for all minority groups, both male and female, and all women, both minority and non-minority. Consequently, the Contractor may be in violation of the Executive Order if a particular group is employed in a substantially disparate manner (for example, even though the Contractor has achieved its goals for women generally, the Contractor may be in violation of the Executive Order if a specific minority group of women is underutilized).

(10) The Contractor shall not use the goals and timetables or affirmative action standards to discriminate against any person because of race, color, religion, sex, or national origin.

(11) The Contractor shall not enter into any Subcontract with any person or firm debarred from Government contracts pursuant to Executive Order 11246.

(12) The Contractor shall carry out such sanctions and penalties for violation of these specifications and of the Equal Opportunity Clause, including suspension, termination and cancellation of existing subcontracts as may be imposed or ordered pursuant to Executive Order 11246, as amended, and its implementing regulations, by the Office of Federal Contract Compliance Programs. Any Contractor who fails to carry out such sanctions and penalties shall be in violation of these specifications and Executive Order 11246, as amended.

(13) The Contractor, in fulfilling its obligations under these specifications, shall implement specific affirmative action steps, at least as extensive as those standards prescribed in paragraph 7 of these specifications, so as to achieve maximum results from its efforts to ensure equal employment opportunity. If the Contract fails to comply with the requirements to the Executive Order, the implementing regulations, or these specifications, the Director shall proceed in accordance with 41 CFR 60-4.8.

(14) The Contractor shall designate a responsible official to monitor all employment related activity to ensure that the company EEO policy is being carried out, to submit reports relating to the provisions hereof as may be required by the Government and to keep records. Records shall at least include for each employee the name, address, telephone numbers, construction trade, union affiliation, if any, employee identification number when assigned, social security number, race, sex, status (e.g., mechanic, apprentice trainee, helper, or laborer), dates of changes of status, hours worked per week in the indicated trade, rate of pay, and locations at which the work was performed. Records shall be maintained in an easily understandable and retrievable form; however, to the degree that existing records satisfy this requirement, contractors shall not be required to maintain separate records.

(15) Nothing herein provided shall be construed as a limitation upon the application of other laws which establish different standards of compliance or upon the application of requirements for the hiring of local or other area residents (e.g., those under the Public Works Employment Act of l977 and the Community Development Block Grant Program).

(b) The notice set forth in 41 CFR 60-4.2 and the specifications set forth in 41 CFR 60-4.3 replace the New Form for Federal Equal Employment Opportunity Bid Conditions for Federal and Federally Assisted Construction published at 41 FR 32482 and commonly known as the Model Federal EEO Bid Conditions, and the New Form shall not used after the regulations in 41 CFR part 60-4 become effective.

Appendix C.

40 CFR PART 33

PARTICIPATION BY DISADVANTAGED BUSINESS ENTERPRISES
IN UNITED STATES ENVIRONMENTAL PROTECTION AGENCY PROGRAMS

Subpart C—Good Faith Efforts

§ 33.301 What does this subpart require?

A recipient, including one exempted from applying the fair share objective requirements by § 33.411, is required to make the following good faith efforts whenever procuring construction, equipment, services and supplies under an EPA financial assistance agreement, even if it has achieved its fair share objectives under subpart D of this part:

(a) Ensure DBEs are made aware of contracting opportunities to the fullest extent practicable through outreach and recruitment activities. For Indian Tribal, State and Local and Government recipients, this will include placing DBEs on solicitation lists and soliciting them whenever they are potential sources.
(b) Make information on forthcoming opportunities available to DBEs and arrange time frames for contracts and establish delivery schedules, where the requirements permit, in a way that encourages and facilitates participation by DBEs in the competitive process. This includes, whenever possible, posting solicitations for bids or proposals for a minimum of 30 calendar days before the bid or proposal closing date.
(c) Consider in the contracting process whether firms competing for large contracts could subcontract with DBEs. For Indian Tribal, State and local Government recipients, this will include dividing total requirements when economically feasible into smaller tasks or quantities to permit maximum participation by DBEs in the competitive process.
(d) Encourage contracting with a consortium of DBEs when a contract is too large for one of these firms to handle individually.
(e) Use the services and assistance of the SBA and the Minority Business Development Agency of the Department of Commerce.
(f) If the prime contractor awards subcontracts, require the prime contractor to take the steps in paragraphs (a) through (e) of this section.

§ 33.302 Are there any additional contract administration requirements?

(a) A recipient must require its prime contractor to pay its subcontractor for satisfactory performance no more than 30 days from the prime contractor's receipt of payment from the recipient.
(b) A recipient must be notified in writing by its prime contractor prior to any termination of a DBE subcontractor for convenience by the prime contractor.
(c) If a DBE subcontractor fails to complete work under the subcontract for any reason, the recipient must require the prime contractor to employ the six good faith efforts described in § 33.301 if soliciting a replacement subcontractor.
(d) A recipient must require its prime contractor to employ the six good faith efforts described in § 33.301 even if the prime contractor has achieved its fair share objectives under subpart D of this part.

§ 33.303 Are there special rules for loans under EPA financial assistance agreements?
A recipient of an EPA financial assistance agreement to capitalize a revolving loan fund, such as a State under the CWRLF or DWSRF or an eligible entity under the Brownfields Cleanup Revolving Loan Fund program, must require that borrowers receiving identified loans comply with the good faith efforts described in § 33.301 and the contract administration requirements of §3.302. This provision does not require that such private and nonprofit borrowers expend identified loan funds in compliance with any other procurement procedures contained in 40 CFR part 30, part 31, or part 35, subpart O, as applicable.

§ 33.304 Must a Native American (either as an individual, organization, Tribe or Tribal Government) recipient or prime contractor follow the six good faith efforts?

(a) A Native American (either as an individual, organization, corporation, Tribe or Tribal Government) recipient or prime contractor must follow the six good faith efforts only if doing so would not conflict with existing Tribal or Federal law, including but not limited to the Indian Self-Determination and Education Assistance Act (25 U.S.C. 450e), which establishes, among other things, that any federal contract, subcontract, grant, or subgrant awarded to Indian organizations or for the benefit of Indians, shall require preference in the award of subcontracts and subgrants to Indian organizations and to Indian-owned economic enterprises.

(b) Tribal organizations awarded an EPA financial assistance agreement have the ability to solicit and recruit Indian organizations and Indian-owned economic enterprises and give them preference in the award process prior to undertaking the six good faith efforts. Tribal governments with promulgated tribal laws and regulations concerning the solicitation and recruitment of Native-owned and other minority business enterprises, including women-owned business enterprises, have the discretion to utilize these tribal laws and regulations in lieu of the six good faith efforts. If the effort to recruit Indian organizations and Indian-owned economic enterprises is not successful, then the recipient must follow the six good faith efforts. All tribal recipients still must retain records documenting compliance in accordance with § 33.501 and must report to EPA on their accomplishments in accordance with § 33.502.

(c) Any recipient, whether or not Native American, of an EPA financial assistance agreement for the benefit of Native Americans, is required to solicit and recruit Indian organizations and Indian-owned economic enterprises and give them preference in the award process prior to undertaking the six good faith efforts. If the efforts to solicit and recruit Indian organizations and Indian-owned economic enterprises is not successful, then the recipient must follow the six good faith efforts.

(d) Native Americans are defined in § 33.103 to include American Indians, Eskimos, Aleuts and Native Hawaiians.

Appendix D.

MEMORANDUM

SUBJECT: Implementation of American Iron and Steel provisions of P.L. 113-76, Consolidated Appropriations Act, 2014

FROM: Andrew Sawyers, Director
Office of Wastewater Management (4201M)

Peter Grevatt, Director
Office of Ground Water and Drinking Water (4601M)

TO: Water Management Division Directors
Regions I - X

P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), includes an "American Iron and Steel (AIS)" requirement in section 436 that requires Clean Water State Revolving Loan Fund (CWSRF) and Drinking Water State Revolving Loan Fund (DWSRF) assistance recipients to use iron and steel products that are produced in the United States for projects for the construction, alteration, maintenance, or repair of a public water system or treatment works if the project is funded through an assistance agreement executed beginning January 17, 2014 (enactment of the Act), through the end of Fiscal Year 2014.

Section 436 also sets forth certain circumstances under which EPA may waive the AIS requirement. Furthermore, the Act specifically exempts projects where engineering specifications and plans were approved by a State agency prior to January 17, 2014.

The approach described below explains how EPA will implement the AIS requirement. The first section is in the form of questions and answers that address the types of projects that must comply with the AIS requirement, the types of products covered by the AIS requirement, and compliance. The second section is a step-by-step process for requesting waivers and the circumstances under which waivers may be granted.

Implementation

The Act states:

Sec. 436. (a)

(1) None of the funds made available by a State water pollution control revolving fund as authorized by title VI of the Federal Water Pollution Control Act (33 U.S.C. 1381 et seq.) or made available by a drinking water treatment revolving loan fund as authorized by section 1452 of the Safe Drinking Water Act (42 U.S.C. 300j–12) shall be used for a project for the construction, alteration, maintenance, or repair of a public water system or treatment works unless all of the iron and steel products used in the project are produced in the United States.

(2) In this section, the term ''iron and steel products'' means the following products made primarily of iron or steel: lined or unlined pipes and fittings, manhole covers and other municipal castings, hydrants, tanks, flanges, pipe clamps and restraints, valves, structural steel, reinforced precast concrete, and construction materials.

(b) Subsection (a) shall not apply in any case or category of cases in which the Administrator of the Environmental Protection Agency (in this section referred to as the ''Administrator'') finds that—

(1) applying subsection (a) would be inconsistent with the public interest;

(2) iron and steel products are not produced in the United States in sufficient and reasonably available quantities and of a satisfactory quality; or

(3) inclusion of iron and steel products produced in the United States will increase the cost of the overall project by more than 25 percent.

(c) If the Administrator receives a request for a waiver under this section, the Administrator shall make available to the public on an informal basis a copy of the request and information available to the Administrator concerning the request, and shall allow for informal public input on the request for at least 15 days prior to making a finding based on the request. The Administrator shall make the request and accompanying information available by electronic means, including on the official public Internet Web site of the Environmental Protection Agency.

(d) This section shall be applied in a manner consistent with United States obligations under international agreements.

(e) The Administrator may retain up to 0.25 percent of the funds appropriated in this Act for the Clean and Drinking Water State Revolving Funds for carrying out the provisions described in subsection (a)(1) for management and oversight of the requirements of this section.

(f) This section does not apply with respect to a project if a State agency approves the engineering plans and specifications for the project, in that agency's capacity to approve such plans and specifications prior to a project requesting bids, prior to the date of the enactment of this Act.

The following questions and answers provide guidance for implementing and complying with the AIS requirements:

Project Coverage

What classes of projects are covered by the AIS requirement?

All treatment works projects funded by a CWSRF assistance agreement, and all public water system projects funded by a DWSRF assistance agreement, from the date of enactment through the end of Fiscal Year 2014. The AIS requirements apply to the entirety of the project, no matter when construction begins or ends. Additionally, the AIS requirements apply to all parts of the project, no matter the source of funding.

Covered Iron and Steel Products

What is an iron or steel product?

For purposes of the CWSRF and DWSRF projects that must comply with the AIS requirement, an iron or steel product is one of the following made primarily of iron or steel that is permanently incorporated into the public water system or treatment works:

Lined or unlined pipes or fittings;
Manhole Covers;
Municipal Castings (defined in more detail below);
Hydrants;
Tanks;
Flanges;
Pipe clamps and restraints;
Valves;
Structural steel (defined in more detail below);
Reinforced precast concrete; and
Construction materials (defined in more detail below).

What does the term 'primarily iron or steel' mean?

'Primarily iron or steel' places constraints on the list of products above. For one of the listed products to be considered subject to the AIS requirements, it must be made of greater than 50% iron or steel, measured by cost. The cost should be based on the material costs.

Can you provide an example of how to perform a cost determination?

For example, the iron portion of a fire hydrant would likely be the bonnet, body and shoe, and the cost then would include the pouring and casting to create those components. The other material costs would include non-iron and steel internal workings of the fire hydrant (i.e., stem, coupling, valve, seals, etc.). However, the assembly of the internal workings into the hydrant body would not be included in this cost calculation. If one of the listed products is not made primarily of iron or steel, United States (US) provenance is not required. An exception to this definition is reinforced precast concrete, which is addressed in a later question.

If a product is composed of more than 50% iron or steel, but is not listed in the above list of items, must the item be produced in the US? Alternatively, must the iron or steel in such a product be produced in the US?
The answer to both question is no. Only items on the above list must be produced in the US. Additionally, the iron or steel in a non-listed item can be sourced from outside the US.

What is the definition of steel?
Steel means an alloy that includes at least 50 percent iron, between .02 and 2 percent carbon, and may include other elements. Metallic elements such as chromium, nickel, molybdenum, manganese, and silicon may be added during the melting of steel for the purpose of enhancing properties such as corrosion resistance, hardness, or strength. The definition of steel covers carbon steel, alloy steel, stainless steel, tool steel and other specialty steels.

What does 'produced in the United States' mean?
Production in the United States of the iron or steel products used in the project requires that all manufacturing processes, including application of coatings, must take place in the United States, with the exception of metallurgical processes involving refinement of steel additives. All manufacturing processes includes processes such as melting, refining, forming, rolling, drawing, finishing, fabricating and coating. Further, if a domestic iron and steel product is taken out of the US for any part of the manufacturing process, it becomes foreign source material. However, raw materials such as iron ore, limestone and iron and steel scrap are not covered by the AIS requirement, and the material(s), if any, being applied as a coating are similarly not covered. Non-iron or steel components of an iron and steel product may come from non-US sources. For example, for products such as valves and hydrants, the individual non-iron and steel components do not have to be of domestic origin.

Are the raw materials used in the production of iron or steel required to come from US sources?
No, raw materials, such as iron ore, limestone, scrap iron, and scrap steel, can come from non-US sources.

If an above listed item is primarily made of iron or steel, but is only at the construction site temporarily, must such an item be produced in the US?
No. Only the above listed products made primarily of iron or steel, permanently incorporated into the project must be produced in the US. For example trench boxes or scaffolding or equipment, which are removed from the project site upon completion of the project, are not required to be made of U.S. Iron or Steel.

What is the definition of 'municipal castings'?
Municipal castings are cast iron or steel infrastructure products that are melted and cast. They typically provide access, protection, or housing for components incorporated into utility owned drinking water, storm water, wastewater, and surface infrastructure. They are typically made of grey or ductile iron, or steel. Examples of municipal castings are:

Access Hatches;
Ballast Screen;
Benches (Iron or Steel);
Bollards;
Cast Bases;
Cast Iron Hinged Hatches, Square and Rectangular;
Cast Iron Riser Rings;
Catch Basin Inlet;
Cleanout/Monument Boxes;
Construction Covers and Frames;
Curb and Corner Guards;
Curb Openings;
Detectable Warning Plates;
Downspout Shoes (Boot, Inlet);
Drainage Grates, Frames and Curb Inlets;
Inlets;
Junction Boxes;
Lampposts;
Manhole Covers, Rings and Frames, Risers;
Meter Boxes;
Steel Hinged Hatches, Square and Rectangular;
Steel Riser Rings;
Trash receptacles;
Tree Grates;
Tree Guards;
Trench Grates; and
Valve Boxes, Covers and Risers.

What is 'structural steel'?
Structural steel is rolled flanged shapes, having at least one dimension of their cross-section 3 inches or greater, which are used in the construction of bridges, buildings, ships, railroad rolling stock, and for numerous other constructional purposes. Such shapes are designated as wide-flange shapes, standard I-beams, channels, angles, tees and zees. Other shapes include H-piles, sheet piling, tie plates, cross ties, and those for other special purposes.

What is a 'construction material' for purposes of the AIS requirement?
Construction materials are those articles, materials, or supplies made primarily of iron and steel, that are permanently incorporated into the project, not including mechanical and/or electrical components, equipment and systems. Some of these products may overlap with what is also considered "structural steel". This includes, but is not limited to, the following products: wire rod, bar, angles, concrete reinforcing bar, wire, wire cloth, wire rope and cables, tubing, framing, joists, trusses, fasteners (i.e., nuts and bolts), welding rods, decking, grating, railings, stairs, access ramps, fire escapes, ladders, wall panels, dome structures, roofing, ductwork, surface drains, cable hanging systems, manhole steps, fencing and fence tubing, guardrails, doors, gates, and screens.

What is not considered a 'construction material' for purposes of the AIS requirement?
Mechanical and electrical components, equipment and systems are not considered construction materials. Mechanical equipment is typically that which has motorized parts and/or is powered by a motor. Electrical equipment is typically any machine powered by electricity and includes components that are part of the electrical distribution system.

The following examples (including their appurtenances necessary for their intended use and operation) are NOT considered construction materials: pumps, motors, gear reducers, drives (including variable frequency drives (VFDs)), electrical/pneumatic/manual accessories used to operate valves (such as electric valve actuators), mixers, gates, motorized screens (such as traveling screens), blowers/aeration equipment, compressors, meters, sensors, controls and switches, supervisory control and data acquisition (SCADA), membrane bioreactor systems, membrane filtration systems, filters, clarifiers and clarifier mechanisms, rakes, grinders, disinfection systems, presses (including belt presses), conveyors, cranes, HVAC (excluding ductwork), water heaters, heat exchangers, generators, cabinetry and housings (such as electrical boxes/enclosures), lighting fixtures, electrical conduit, emergency life systems, metal office furniture, shelving, laboratory equipment, and analytical instrumentation, and dewatering equipment.

If the iron or steel is produced in the US, may other steps in the manufacturing process take place outside of the US, such as assembly?
No. Production in the US of the iron or steel used in a listed product requires that all manufacturing processes must take place in the United States, except metallurgical processes involving refinement of steel additives.

What processes must occur in the US to be compliant with the AIS requirement for reinforced precast concrete?
While reinforced precast concrete may not be at least 50% iron or steel, in this particular case, the reinforcing rebar must be produced in the US and meet the same standards as for any other iron or steel product. Additionally, the casting of the concrete product must take place in the US. The cement and other raw materials used in concrete production are not required to be of domestic origin.

If the reinforced concrete is cast at the construction site, the reinforcing rebar is considered to be a construction material and must be produced in the US.

Compliance

How should an assistance recipient document compliance with the AIS requirement?

In order to ensure compliance with the AIS requirement, specific AIS contract language must be included in each contract, starting with the assistance agreement, all the way down to the purchase agreements.

EPA recommends the use of a step certification process, similar to one used by the Federal Highway Administration. The step certification process is a method to ensure that producers adhere to AIS requirements and assistance recipients can verify that products comply with the AIS requirement. The process also establishes accountability and better enables States to take enforcement actions against violators.

Step certification creates a paper trail which documents the location of the manufacturing process involved with the production of steel and iron materials. A step certification is a process under which each handler (supplier, fabricator, manufacturer, processor, etc.) of the iron and steel products certifies that their step in the process was domestically performed. Each time a step in the manufacturing process takes place, the manufacturer delivers its work along with a certification of its origin. A certification can be quite simple. Typically, it includes the name of the manufacturer, the location of the manufacturing facility where the product or process took place (not its headquarters), a description of the product or item being delivered, and a signature by a manufacturer's responsible party. Attached, as Attachment 3, is a sample certification. These certifications should be collected and maintained by the assistance recipients.

Alternatively, the final manufacturer that delivers the iron or steel product to either the worksite, vendor, or contractor, may provide a certification asserting that all manufacturing processes occurred in the US. While this type of certification may be acceptable, it may not provide the same degree of assurance. Additional documentation may be needed if the certification is lacking important information. Step certification is the best practice.

How should a State ensure assistance recipients are complying with the AIS requirement?

States should, as a best practice, conduct site visits of projects during construction and review documentation demonstrating proof of compliance which the assistance recipient has gathered.

What happens if a State or EPA finds a non-compliant iron and/or steel product permanently incorporated in the project?
If a potentially noncompliant product is identified, the State should notify the assistance recipient of the apparent unauthorized use of a non-domestic component, including a proposed corrective action, and should be given the opportunity to reply. If unauthorized use is confirmed, the State can take one or more of the following actions: request a waiver where appropriate; require the removal of the non-domestic item; or withhold payment for all or part of the project. Only EPA can issue waivers to authorize the use of a non-domestic item. EPA may use remedies available to it under the Clean Water Act, the Safe Drinking Water Act, and 40 CFR part 31 grant regulations in the event of a violation of a grant term and condition.

It is recommended that the State work collaboratively with EPA to determine the appropriate corrective action, especially in cases where the State is the one who identifies the item in noncompliance or there is a disagreement with the assistance recipient.

If fraud, waste, abuse, or any violation of the law is suspected, the Office of Inspector General (OIG) should be contacted immediately. The OIG can be reached at 1 (888) 546-8740 or OIG_Hotline@epa.gov. More information can be found at this website: http://www.epa.gov/oig/hotline.htm.

How do international trade agreements affect the implementation of the AIS requirements?
The AIS provision applies in a manner consistent with United States obligations under international agreements. Typically, these obligations only apply to direct procurement by the entities that are signatories to such agreements. In general, SRF assistance recipients are not signatories to such agreements, so these agreements have no impact on this AIS provision. In the few instances where such an agreement applies to a municipality, that municipality is under the obligation to determine its applicability and requirements and document the actions taken to comply for the State.

Waiver Process

The statute permits EPA to issue waivers for a case or category of cases where EPA finds (1) that applying these requirements would be inconsistent with the public interest; (2) iron and steel products are not produced in the US in sufficient and reasonably available quantities and of a satisfactory quality; or (3) inclusion of iron and steel products produced in the US will increase the cost of the overall project by more than 25 percent.

In order to implement the AIS requirements, EPA has developed an approach to allow for effective and efficient implementation of the waiver process to allow projects to proceed in a timely manner. The framework described below will allow States to apply for waivers of the AIS requirement directly to EPA Headquarters. Pursuant to the Act, EPA has the responsibility to make findings as to the issuance of waivers to the AIS requirements.

Definitions
The following terms are critical to the interpretation and implementation of the AIS requirements and apply to the process described in this memorandum:

Reasonably Available Quantity: The quantity of iron or steel products is available or will be available at the time needed and place needed, and in the proper form or specification as specified in the project plans and design.

Satisfactory Quality: The quality of iron or steel products, as specified in the project plans and designs.

Assistance Recipient: A borrower or grantee that receives funding from a State CWSRF or DWSRF program.

Step-By-Step Waiver Process
Application by Assistance Recipient
Each local entity that receives SRF water infrastructure financial assistance is required by section 436 of the Act to use American made iron and steel products in the construction of its project. However, the recipient may request a waiver. Until a waiver is granted by EPA, the AIS requirement stands, except as noted above with respect to municipalities covered by international agreements.

The waiver process begins with the SRF assistance recipient. In order to fulfill the AIS requirement, the assistance recipient must in good faith design the project (where applicable) and solicit bids for construction with American made iron and steel products. It is essential that the assistance recipient include the AIS terms in any request for proposals or solicitations for bids, and in all contracts. The assistance recipient may seek a waiver at any point before, during, or after the bid process, but before installation of the product, if one or more of the following three conditions is met:

1. Applying the American Iron and Steel requirements of the Act would be inconsistent with the public interest;
2. Iron and steel products are not produced in the United States in sufficient and reasonably available quantities and of a satisfactory quality; or
3. Inclusion of iron and steel products produced in the United States will increase the cost of the overall project by more than 25 percent.

Proper and sufficient documentation must be provided by the assistance recipient. A checklist detailing the types of information required for a waiver to be processed is attached as Attachment 1.

Additionally, it is strongly encouraged that assistance recipients hold pre-bid conferences with potential bidders. A pre-bid conference can help to identify iron and steel products needed to complete the project as described in the plans and specifications that may not be available from domestic sources. It may also identify the need to seek a waiver prior to bid, and can help inform the recipient on compliance options.

In order to apply for a project waiver, the assistance recipient should email the request in the form of a Word document (.doc) to the State SRF Engineer. The State SRF designee will review the application for the waiver and determine whether the necessary information has been included. Once the waiver application is complete, the State designee will forward the application to either of two email addresses. For CWSRF waiver requests, please send the application to: cwsrfwaiver@epa.gov. For DWSRF waiver requests, please send the application to: dwsrfwaiver@epa.gov.

Evaluation by EPA

After receiving an application for waiver of the AIS requirements, EPA Headquarters will publish the request on its website for 15 days and receive informal comment. EPA Headquarters will then use the checklist in Attachment 2 to determine whether the application properly and adequately documents and justifies the statutory basis cited for the waiver – that it is quantitatively and qualitatively sufficient – and to determine whether or not to grant the waiver.

In the event that EPA finds that adequate documentation and justification has been submitted, the Administrator may grant a waiver to the assistance recipient. EPA will notify the State designee that a waiver request has been approved or denied as soon as such a decision has been made. Granting such a waiver is a 3-step process:

1. Posting – After receiving a complete application for a waiver, EPA is required to publish the application and all material submitted with the application on EPA's website for 15 days. During that period, the public will have the opportunity to review the request and provide informal comment to EPA. The website can be found at: http://water.epa.grants_funding/aisrequirement.cfm
2. Evaluation – After receiving an application for waiver of the AIS requirements, EPA Headquarters will use the checklist in Attachment 2 to determine whether the application properly and adequately documents and justifies the statutory basis cited for the waiver – that it is quantitatively and qualitatively sufficient – and to determine whether or not to grant the waiver.
3. Signature of waiver approval by the Administrator or another agency official with delegated authority – as soon as the waiver is signed and dated, EPA will notify the State SRF program, and post the signed waiver on our website. The assistance recipient should keep a copy of the signed waiver in its project files.

Public Interest Waivers

EPA has the authority to issue public interest waivers. Evaluation of a public interest waiver request may be more complicated than that of other waiver requests so they may take additional time for a decision to be made. An example of a public interest waiver that might be issued could be for a community that has standardized on a particular type or manufacturer of a valve because of its performance to meet their specifications. Switching to an alternative valve may require staff to be trained on the new equipment and additional spare parts would need to be purchased and stocked, existing valves may need to be unnecessarily replaced, and portions of the system may need to be redesigned. Therefore, requiring the community to install an alternative valve would be inconsistent with public interest.

EPA also has the authority to issue a public interest waiver that covers categories of products that might apply to all projects.

EPA reserves the right to issue national waivers that may apply to particular classes of assistance recipients, particular classes of projects, or particular categories of iron or steel products. EPA may develop national or (U.S. geographic) regional categorical waivers through the identification of similar circumstances in the detailed justifications presented to EPA in a waiver request or requests. EPA may issue a national waiver based on policy decisions regarding the public's interest or a determination that a particular item is not produced domestically in reasonably available quantities or of a sufficient quality. In such cases, EPA may determine it is necessary to issue a national waiver.

If you have any questions concerning the contents of this memorandum, you may contact us, or have your staff contact Jordan Dorfman, Attorney-Advisor, State Revolving Fund Branch, Municipal Support Division, at dorfman.jordan@epa.gov or (202) 564-0614 or Kiri Anderer, Environmental Engineer, Infrastructure Branch, Drinking Water Protection Division, at anderer.kirsten@epa.gov or (202) 564-3134.

Attachment 1: Information Checklist for Waiver Request

The purpose of this checklist is to help ensure that all appropriate and necessary information is submitted to EPA. EPA recommends that waiver applicants review this checklist carefully and provide all appropriate information to EPA. This checklist is for informational purposes only and does not need to be included as part of a waiver application.

Items	✓	Notes
General • Waiver request includes the following information: — Description of the foreign and domestic construction materials — Unit of measure — Quantity — Price — Time of delivery or availability — Location of the construction project — Name and address of the proposed supplier — A detailed justification for the use of foreign construction materials • Waiver request was submitted according to the instructions in the memorandum • Assistance recipient made a good faith effort to solicit bids for domestic iron and steel products, as demonstrated by language in requests for proposals, contracts, and communications with the prime contractor		
Cost • Waiver request includes the following information: — Comparison of overall cost of project with domestic iron and steel products to overall cost of project with foreign iron and steel products — Relevant excerpts from the bid documents used by the contractors to complete the comparison — Supporting documentation indicating that the contractor made a reasonable survey of the market, such as a description of the process for identifying suppliers and a list of contacted suppliers		
Availability • Waiver request includes the following supporting documentation necessary to demonstrate the availability, quantity, and/or quality of the materials for which the waiver is requested: — Supplier information or pricing information from a reasonable number of domestic suppliers indicating availability/delivery date for construction materials — Documentation of the assistance recipient's efforts to find available domestic sources, such as a description of the process for identifying suppliers and a list of contacted suppliers. — Project schedule — Relevant excerpts from project plans, specifications, and permits indicating the required quantity and quality of construction materials • Waiver request includes a statement from the prime contractor confirming the non-availability of the domestic construction materials for which the waiver is sought • Has the State received other waiver requests for the materials described in this waiver request, for comparable projects?		

Attachment 2: EPA HQ Review Checklist for Waiver Request

Instructions: To be completed by EPA. Review all waiver requests using the questions in the checklist, and mark the appropriate box as Yes, No or N/A. Marks that fall inside the shaded boxes may be grounds for denying the waiver. If none of your review markings fall into a shaded box, the waiver is eligible for approval if it indicates that one or more of the following conditions applies to the domestic product for which the waiver is sought:

1. The iron and/or steel products are not produced in the United States in sufficient and reasonably available quantities and of a satisfactory quality.
2. The inclusion of iron and/or steel products produced in the United States will increase the cost of the overall project by more than 25 percent.

Review Items	Yes	No	N/A	Comments
Cost • Does the waiver request include the following information? — Comparison of overall cost of project with domestic iron and steel products to overall cost of project with foreign iron and steel products				
— Relevant excerpts from the bid documents used by the contractors to complete the comparison				
— A sufficient number of bid documents or pricing information from domestic sources to constitute a reasonable survey of the market				
• Does the Total Domestic Project exceed the Total Foreign Project Cost by more than 25%?				
Availability • Does the waiver request include supporting documentation sufficient to show the availability, quantity, and/or quality of the iron and/or steel product for which the waiver is requested? — Supplier information or other documentation indicating availability/delivery date for materials — Project schedule — Relevant excerpts from project plans, specifications, and permits indicating the required quantity and quality of materials				
• Does supporting documentation provide sufficient evidence that the contractors made a reasonable effort to locate domestic suppliers of materials, such as a description of the process for identifying suppliers and a list of contacted suppliers?				
• Based on the materials delivery/availability date indicated in the supporting documentation, will the materials be unavailable when they are needed according to the project schedule? (By item, list schedule date and domestic delivery quote date or other relevant information)				
• Is EPA aware of any other evidence indicating the non-availability of the materials for which the waiver is requested? Examples include: — Multiple waiver requests for the materials described in this waiver request, for comparable projects in the same State — Multiple waiver requests for the materials described in this waiver request, for comparable projects in other States — Correspondence with construction trade associations indicating the non-availability of the materials				
• Are the available domestic materials indicated in the bid documents of inadequate quality compared those required by the project plans, specifications, and/or permits?				

Attachment 3: Sample Certification for Step Certification Process

The following information is provided as a sample letter of step certification for Buy America compliance. Documentation must be provided on company letterhead.

Date

Company Name

Company Address
City, State Zip

Subject: Buy America Step Certification for Project (XXXXX-XXXXXXA)

I, (company representative), certify that the (melting, bending, coating, galvanizing, cutting, etc.) process for (manufacturing or fabricating) the following products and/or materials shipped or provided for the subject project is in full compliance with the American Iron and Steel requirement as mandated in EPA's State Revolving Fund Programs.
Item, Products and/or Materials:

1. Xxxx
2. Xxxx
3. Xxxx

If any of the above compliance statements change while providing material to this project we will immediately notify the prime contractor and the engineer.

Signed by company representative

The following information is provided as a sample letter of certification for Buy America compliance. Documentation must be provided on company letterhead.

Date

Company Name

Company Address
City, State Zip

Subject: Buy America Certification for Project (XXXXX-XXXXXXA)

I, (company representative), certify that the following products and/or materials shipped/provided to the subject project are in full compliance with the American Iron and Steel requirement as mandated in EPA's State Revolving Fund Programs.
Item, Products and/or Materials:

1. Xxxx
2. Xxxx
3. Xxxx

If any of the above compliance statements change while providing material to this project we will immediately notify the prime contractor and the engineer.

Signed by company representative

Appendix E.

Prohibition on Certain Telecommunication and Video Surveillance Services or Equipment in the SRF Programs

OFFICE OF WATER
UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

MEMORANDUM

SUBJECT: Prohibition on Certain Telecommunication and Video Surveillance Services or Equipment in the SRF Programs

FROM: Kiri Anderer, P.E., Acting Associate Branch Chief
Infrastructure Branch, OGWDW

Michael Deane, Branch Chief
State Revolving Fund Branch, OWM

TO: SRF Branch Chiefs
Regions 1-10

Effective August 13, 2020, recipients and subrecipients of EPA funded assistance agreements, including borrowers under EPA funded revolving loan funds, must comply with regulations at 2 CFR 200.216, *Prohibition on certain telecommunication and video surveillance services or equipment*, implementing section 889 of Public Law 115-232. The regulation prohibits the use of Federal funds to procure (enter into, extend, or renew contracts) or obtain equipment, systems, or services that use "covered telecommunications equipment or services" identified in the regulation as a substantial or essential component of any system, or as critical technology as part of any system. Prohibitions extend to the use of Federal funds by recipients and subrecipients to enter into a contract with an entity that "uses any equipment, system, or service that uses covered telecommunications equipment or services" as a substantial or essential component of any system, or as critical technology as part of any system. Certain equipment, systems, or services, including equipment, systems, or services produced or provided by entities subject to the prohibition are recorded in the System for Award Management exclusion list.

As described in section 889 of Public Law 115-232, covered telecommunications equipment or services includes:

- Telecommunications equipment produced by Huawei Technologies Company or ZTE Corporation (or any subsidiary or affiliate of such entities).
- For the purpose of public safety, security of government facilities, physical security surveillance of critical infrastructure, and other national security purposes, video surveillance and telecommunications equipment produced by Hytera Communications Corporation, Hangzhou Hikvision Digital Technology Company, or Dahua Technology Company (or any subsidiary or affiliate of such entities).

- Telecommunications or video surveillance services provided by such entities or using such equipment.
- Telecommunications or video surveillance equipment or services produced or provided by an entity that the Secretary of Defense, in consultation with the Director of the National Intelligence or the Director of the Federal Bureau of Investigation, reasonably believes to be an entity owned or controlled by, or otherwise connected to, the government of a covered foreign country.

Applicability in the State Revolving Fund (SRF) Programs
Clean Water and Drinking Water SRF (CWSRF and DWSRF) programs may not expend equivalency funds for these products on or after August 13, 2020. States must ensure that equivalency assistance agreements include the telecommunications prohibition condition provided by EPA's Office of Grants and Debarment (OGD) in OGD's most recent EPA General Terms and Conditions. The condition must also be in construction contracts associated with equivalency assistance agreements.

There is no exhaustive list of components and services that fall under the prohibition. State SRF managers and local assistance recipients should exercise due diligence and be particularly mindful of project components with internet or cellular connections. For example, recipients should be mindful of automatic meter reading (AMR) technology and advanced metering infrastructure (AMI), instrumentation control systems (e.g. process control systems, distributed control systems and programmable logic controls), and security cameras and other electronic security measures to ensure that those items are procured from a non-excluded entity. Items included in the prohibition are not eligible SRF costs, and the SRF programs cannot reimburse borrowers for these costs.

The prohibition also applies to the CWSRF administrative funds (if states are billing those costs to the federal CWSRF capitalization grant) and the four DWSRF set-asides. States should be mindful of items such as cell phones, computers, and mobile WiFi routers or hotspots funded by those accounts.

If you have questions on the implementation of this grant condition, please contact Michael Deane at Deane.Michael@epa.gov or Kiri Anderer at Anderer.Kirsten@epa.gov.

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CONTRACTOR'S ACT OF ASSURANCE FORM

As the authorized agent of the individual, incorporation, or corporation (hereinafter referred to as the Contractor) bidding on or participating in a Revolving Loan Fund (RLF) financed project, I certify that I have read and understand the requirements of the RLF Supplemental General Conditions, and that the principles, agents and employees of the Contractor will comply with these requirements, including all relevant statutes and regulations issued pursuant thereto. As the authorized agent of the Contractor, I further certify that:

DBE/MBE/WBE During the bid process, and throughout the performance of the Contract, whenever subcontracts are to be awarded, I will take the six affirmative steps described in the RLF Supplemental General Conditions to use Disadvantaged, Minority and Women's Business (DBE/MBE/WBE) firms wherever possible. I will document to the borrower and the Arkansas Natural Resources Commission all efforts to secure DBE/MBE/WBE participation, including follow-up efforts, and will report to the Owner the dollar value of all DBE/MBE/WBE contracts and subcontracts awarded.

AMERICAN IRON AND STEEL I will comply with the statutory requirements commonly known as “American Iron and Steel;” that requires all of the iron and steel products used in the project to be produced in the United States pursuant to this contract and the RLF Supplemental General Conditions. I understand that all of the iron and steel products used in the project will be and/or have been produced in the United States in a manner that complies with the American Iron and Steel Requirement, unless a waiver of the requirement is approved, and I will provide any further verified information, certification or assurance of compliance with this paragraph, or information necessary to support a waiver of the American Iron and Steel Requirement as detailed in the RLF Supplemental General Conditions.

EQUAL OPPORTUNITY I will comply with all requirements of 41 CFR Chapter 60 and Executive Orders 11246 and 11375, including inclusion of all required equal opportunity clauses in each subcontract awarded in excess of $10,000, and will furnish a similar statement from each proposed subcontractor, when appropriate. I will also comply with all Equal Employment Opportunity requirements as defined by Section 504 of the Rehabilitation Act of 1973; the Age Discrimination Act of 1975; and Section 13 of the Federal Water Pollution Control Act Amendments of 1972 regarding sex discrimination.

NONSEGREGATED FACILITIES The Contractor that I represent does not and will not maintain any facilities provided for its employees in a segregated manner, or permit its employees to perform their services at any location under the Contractor's control where segregated facilities are maintained. I will also obtain a similar certification from each subcontractor prior to the award of any subcontract exceeding $10,000 to said subcontractor, which is not exempt from the equal opportunity clause.

LABOR STANDARDS I will comply with the Labor Standards Provisions contained in Davis–Bacon wage rates specific to this contract and the RLF Supplemental General Conditions. I understand that the aggregate wage rates paid to any employees must equal or exceed the sum total of the base rate plus any listed fringe rate. I will furnish weekly payrolls and certifications as may be required by the Owner to affirm compliance. I will also require that weekly payrolls be submitted to the Owner for all Subcontracts.

OSHA REQUIREMENTS I will comply with the Department of Labor Occupational Safety and Health Administration (OSHA) Regulations promulgated under Section 107 of the Contract Work Hours and Safety Standard Act (40 U.S.C. 327-333) in performance of the contract.

PROCUREMENT PROHIBITIONS In compliance with Executive Order 11738, Section 306 of the Clean Air Act and Section 508 of the Clean Water Act, I certify that I will not procure goods and services from persons who have been convicted of violations of either law, if the facility that gave rise to said violations produces said goods or services.

PRESERVATION OF OPEN COMPETITION In accordance with Executive Order 13202 and its amendments, I certify that I have not discriminated against my employees or any subcontractor based upon labor affiliation or lack thereof.

RESPONSIBILITIES OF PARTICIPANTS REGARDING TRANSACTIONS (A.K.A. DEBARMENT AND SUSPENSION) I certify that I shall fully comply with Subpart C of 40 CFR Part 32, entitled "Responsibilities of Participants Regarding Transactions." I am responsible for ensuring that any lower tier covered transaction, as described in Subpart B of 40 CFR Part 32, entitled "Covered Transactions," includes a term or condition requiring compliance with Subpart C. I am responsible for further requiring the inclusion of a similar term or condition in any subsequent lower tier covered transactions. I acknowledge that failing to disclose the information required under 40 CFR 32.335 may result in the delay or negation of this assistance agreement, or pursuance of legal remedies, including suspension and debarment. I further acknowledge that I may access the Excluded Parties List System at http://www.epls.gov. This term and condition supersede EPA Form 5700-49, "Certification Regarding Debarment, Suspension, and Other Responsibility Matters."

PROHIBITION ON CERTAIN TELECOMMUNICATION AND VIDEO SURVEILLANCE SERVICES OR EQUIPMENT I will comply with regulations at 2 CFR 200.216, designated as the "Prohibition on certain telecommunication and video surveillance services or equipment", implementing section 889 of Public Law 115-232 and repeated in the RLF Supplemental General Conditions. The regulation prohibits the use of federal funds to procure, enter into, extend, or renew contracts, or obtain equipment, systems, or services that use "covered telecommunications equipment or services" identified in the regulation as a substantial or essential component of any system, or as critical technology as part of any system. I understand that all products used in this contract will meet this requirement and that I will provide further verified information, certification or assurance of compliance with this paragraph, or information necessary to this prohibition as detailed in the RLF Supplemental General Conditions.

I understand that a false statement on this certification regarding any of the above certifications may subject the Contractor or Subcontractor to civil or criminal prosecution. I further certify that I will obtain a similar certification for each subcontract awarded.

AUTHORIZED AGENT

CONTRACTOR NAME: _____ ARKANSAS LICENSE NO. _____

SIGNATURE: _____ DATE: _____

PRINTED NAME: _____ TITLE: _____

SECTION 01110

SUMMARY OF WORK

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The Work of this Contract is located at the Bentonville Water Resource Recovery Facility, 1901 NE “A” Street, Bentonville, Arkansas 72712.

B. Furnish all labor, materials, equipment, and incidentals required and construct the Bentonville WRRF Improvements in its entirety as shown on the Drawings and as specified herein.

C. The Work includes, but is not necessarily limited to the following:

1. Construction of a new Influent Building, including two (2) mechanical bar screens and one (1) manual bypass bar screen, two (2) grit separator units, two (2) grit washer units, one (1) odor control unit, and a wet weather diversion structure.

2. Construction of an Electrical Building including associated medium voltage electrical feeds

3. Modification of existing Anoxic Basins and Construction of new Biological Nutrient Removal Structures

4. Modifications of existing Aeration Basins

5. Construction of one (1) new Surface Wasting Pump Station

6. Modification of the existing Secondary Clarifier Distribution Structure

7. Demolition of one (1) existing Secondary Clarifier

8. Construction of two (2) new Secondary Clarifiers

9. Modifications to mechanisms of two (2) existing Secondary Clarifiers

10. Construction of one (1) new RAS Pump Station

11. Construction of a new Pile Cloth Media Filter with four (4) filter cells

12. Construction of two (2) parallel UV Channels

13. Construction of two (2) parallel Post-Aeration Basins

14. Construction of a Parshall Flume

15. Construction of an Effluent Pump Station and Electrical Building

16. Construction of Aluminum Sulfate Chemical Feed System

17. Construction of six (6) electromagnetic flow meter vaults

18. Construction of one (1) new lift station

19. Modifications to the existing Administration/Laboratory Building

20. Construction of a new the Maintenance Building

21. Demolition of the existing Maintenance Building

22. Construction of four (4) valve vaults

23. Construction of site piping improvements

24. Installation of Site Paving and other site improvements

1.02 MATERIALS COMPLIANCE WITH AIS

A. P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), includes an “American Iron and Steel (AIS)” requirement in section 436 that requires Clean Water State Revolving Loan Fund (CWSRF) and Drinking Water State Revolving Loan Fund (DWSRF) assistance recipients to use iron and steel products that are produced in the United States for projects for the construction, alteration, maintenance, or repair of a public water system or treatment works. This Project meets the definition of such work, and the Environment Protection Agency (EPA) implementation requirements for this AIS requirement are outlined within the DWSRF memorandum titled “Implementation of American Iron and Steel provisions of P.L. 113-76, Consolidated Appropriations Act, 2014” included as part of the RLF Supplemental General Conditions.

B. All parties are required to comply with these requirements and to ensure that all qualifying iron and steel products used in this project must be produced in the United States. See RLF Supplemental General Conditions for additional details.

1.03 RELATED SECTIONS

A. Section 01170 – Special Provisions

B. Section 01350 – Environmental Protection Procedures

1.04 COORDINATION WITH OWNER'S OPERATIONS AND EXISTING FACILITIES

A. Several parts of the proposed Work under this Contract will connect with or into existing facilities. Some Contract locations are particularly sensitive because of the attendant necessary down-time of existing wastewater treatment operations, or because of the extraordinary inconvenience to the Owner’s personnel and to the routine that is required in the continuous operation of equipment or facilities. Because of this sensitivity, the Contractor shall carefully plan the schedule of that portion of the Work that will affect the

existing facilities. Such plans and schedules shall be subject to the approval of the Owner.

B. Work that requires shutdown or in any way impedes the operations of existing facilities shall be closely coordinated with the Owner.

C. The Contractor shall outline and submit a scheduled plan with the construction schedule for installation of the Work that requires interruption of operations.

1.05 WORK SEQUENCE

A. Perform Work in such a manner to ensure completion of the Work within the Contract Time. Completion dates of the various stages shall be in accordance with the approved construction schedule submitted by the Contractor. Work may be scheduled at the Contractor's discretion and with the approval of the Engineer.

1.06 PROGRESS OF THE WORK

A. The Work shall be started on the date indicated on the Notice to Proceed. The Work shall be executed with such progress as may be required to prevent any delay to the general completion of the Project. The Work shall be executed at such times and in or on such parts of the Project, and with such personnel, materials, and equipment to assure completion of the Work within the Contract Time established by the Agreement.

B. Unless otherwise approved by the Owner, normal working hours for this project are Monday through Friday, 8:00 a.m. to 5:00 p.m., for installation of piping, placement of concrete, construction of pavement sections, etc. Written requests for Owner’s approval to conduct work outside of normal working hours shall be submitted to the Engineer and shall allow ample time for the Engineer to arrange for inspection of the Work in progress. Unless otherwise specifically detailed in the Specifications or on the Drawings, work outside of normal working hours shall be for the Contractor’s convenience, and the Contractor shall pay all expenses (at Engineer's standard rates) associated with extra inspection required for Work outside regular hours. The Contractor shall light the different parts of the Project as required to comply with all applicable federal and state regulations and with all applicable requirements of the Owner. The Contractor may conduct preparatory work, staging of pipe or other materials, and site cleanup outside of the normal working hours or on weekends provided that the work is not near private residences.

1.07 CONTRACTOR'S USE OF PREMISES

A. Limit the use of the premises to the Contractor’s Work, storage of materials and equipment, and to allow for:

1. Work by other contractors
2. Owner occupancy
3. Public use

B. Coordinate use of premises with Owner.

C. Assume full responsibility for all site security, including materials and equipment stored on site, and those of all Subcontractors.

D. If directed by the Owner, move any stored items that interfere with operations of Owner or other contractors.

E. Obtain and pay for use of additional storage or work areas if needed to perform the Work.

F. Contractor shall submit to the Owner for approval a plan of operations, designating proposed areas of the property to be used for his operations, material storage, equipment storage, employee's parking, offices, and shops. The area shall have minimal interference with the present operations.

G. Any damage to existing facilities, including contamination, which may be caused by Contractor's personnel, callers, visitors, materials, or equipment, shall be repaired or corrected at the sole expense of the Contractor.

H. Any fence that is damaged or removed by the Contractor shall be replaced at the Contractor's expense in like size and kind, and to the satisfaction of the Engineer.

1.10 OWNER OCCUPANCY

A. Owner will occupy premises during performance of the Work for conducting the Owner’s normal operations. Coordinate all construction operations with Owner to minimize conflict and to facilitate Owner usage.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01111

SITE CONDITIONS

PART 1 GENERAL

1.01 SCOPE OF WORK

A. In general, follow the guidelines below when dealing with existing conditions on or adjacent to the site. These guidelines are not intended to restrict or replace professional judgment by the Contractor.

1.02 MATERIALS COMPLIANCE WITH AIS

A. P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), includes an “American Iron and Steel (AIS)” requirement in section 436 that requires Clean Water State Revolving Loan Fund (CWSRF) and Drinking Water State Revolving Loan Fund (DWSRF) assistance recipients to use iron and steel products that are produced in the United States for projects for the construction, alteration, maintenance, or repair of a public water system or treatment works. This Project meets the definition of such work, and the Environment Protection Agency (EPA) implementation requirements for this AIS requirement are outlined within the DWSRF memorandum titled “Implementation of American Iron and Steel provisions of P.L. 113-76, Consolidated Appropriations Act, 2014” included as part of the RLF Supplemental General Conditions.

B. All parties are required to comply with these requirements and to ensure that all qualifying iron and steel products used in this project must be produced in the United States. See RLF Supplemental General Conditions for additional details.

1.03 RELATED SECTIONS

A. Section 01110 – Summary of Work

B. Section 02100 – Site Preparation

1.04 SITE CONDITIONS

A. Site Information

1. Confine all activities to public rights-of-way or to the Owner’s property unless specific authorization is granted to use other properties.

2. Submit a traffic control plan for review and comment by the Engineer. Furnish and install flaggers, signage, barricades, lighting, and all other traffic control features necessary to implement the plan. The traffic control plans shall conform to the requirements of the City of Bentonville, Arkansas where the project is located and to the latest copy of the Manual on Uniform Traffic Control Devices (MUTCD) by the U.S. DOT, FHWA.

3. Do not close streets or driveways overnight without written permission from the local municipality. Obtain a street closure permit prior to commencing work.

B. Subsurface Information

1. The Contractor may obtain electronic copies of geotechnical and/or environmental reports from the Engineer.

2. The information contained in the reports identified above is based on surface observations only at specific locations at the site or is based on subsurface conditions only at specific boring locations, and only at the time that the observations and borings were conducted. The Contractor should not infer that this technical data is indicative of the entire site. Further, the Contractor is required to conduct additional site investigations as necessary to satisfy any additional questions.

3. The Contractor is not entitled to rely upon any other information or data known to or identified by Owner and Engineer.

C. Site Investigation and Representation

1. The Contractor acknowledges that he has satisfied himself as to the nature and location of the Work; the general and local conditions, particularly those bearing upon availability of transportation, disposal, handling and storage of materials, availability of labor, water, electric power, roads, and uncertainties of weather, river/stream stages, or similar physical conditions at the site; the conformation and conditions of the ground; the character of equipment and facilities needed preliminary to and during the prosecution of the Work and all other matters which can in any way affect the Work or the cost thereof under this Contract.

2. The Contractor further acknowledges that he has satisfied himself as to the character, quality, and quantity of surface and subsurface materials to be encountered from inspecting the site and from evaluating any information on subsurface and physical conditions provided by the Owner. Any failure by the Contractor to acquaint himself with all the available information will not relieve him from responsibility for properly estimating the difficulty or cost of successfully performing the Work. Neither the Owner nor the Engineer assumes responsibility for any conclusion or interpretation made by the Contractor based on the information made available by the Owner or the Engineer.

3. The Contractor shall be responsible for the notification of utility location services, including Arkansas 811 and other utility location services not specifically listed, sufficiently in advance of excavation activities to allow for the field location of any underground utilities and structures. The Arkansas 811 telephone number is 1-800-482-8998. A minimum of 48-hour prior notification is required.

D. Responsibility for Utility Properties and Service

1. The Drawings show known utilities and structures adjacent to or to be encountered in the Work. The locations shown are taken from existing records and the best information available from existing plans; however, it is expected that there may be some discrepancies and omissions in the locations and quantities of utilities and

structures shown. This information is shown only for the Contractor's convenience, and neither the Owner nor the Engineer assumes any responsibility as to its accuracy or completeness. The Contractor shall make every effort to locate all underground utilities and structures by prospecting in advance of excavation activities.

2. Neither the Owner nor his officers or agents shall be responsible for damages as a result of the Contractor's failure to protect utilities encountered in the Work.

3. Provide unobstructed access to fire hydrants, underground conduit, manholes, and water or gas valve boxes.

4. Where the Contractor's operations are adjacent to existing utilities and services; and when operations could cause damage that would result in considerable loss, expense, and inconvenience; then the Contractor shall not commence the Work until making necessary arrangements for their protection. These utilities and service shall include but not be limited to railway, fiber optic, telephone, television, power, oil, gas, water, sanitary sewer, storm drain, irrigation, or other systems.

5. Notify all utility offices that are affected by the construction operation at least fifteen (15) days in advance of commencing construction operations. Do not expose any utility without first obtaining permission from the affected agency. Once permission has been granted, locate and if necessary, expose and provide temporary support for all existing underground utilities in advance of operations.

6. The Contractor shall be solely and directly responsible to the owners and operators of such utility properties for any damage, injury, expense, loss, inconvenience, delay, suits, actions, or claims of any character brought because of any injuries or damage that may result from the construction operations under this Contract.

7. In the event of interruption to domestic water, sanitary sewer, storm drain, or other utility services because of accidental breakage due to construction operations, the Contractor shall promptly notify the proper authority, cooperate with said authority in restoration of service as promptly as possible, and bear all costs of repair. In no event shall interruption of any public or franchised utility service be allowed unless the owner of the utility grants prior approval.

8. Replace at Contractor's expenses any existing utilities or structures removed or damaged during construction unless the Contract Documents indicate otherwise.

9. Where existing utility lines or structures are so located as to physically conflict with permanent structures to be constructed under this Contract, the conflicting utility line or structure shall be permanently relocated. Such relocations shall be considered as required by this Contract.

10. Give immediate notice to the Engineer, the Owner, and the owner of the utility (where applicable) when a physical conflict or interference is determined to exist; and then obtain approval to relocate such utility or to discontinue service therein from the Engineer and the owner of the utility. The owner of the utility shall have the right to do all work required to discontinue, relocate, and replace interfering utilities and charge the Contractor for all costs thereof. When approved by the Engineer and the

owner of the utility, all work required to discontinue, relocate, and replace interfering utilities may be done by the Contractor. All such discontinuance, relocation, and replacement shall be accomplished in accordance with all requirements of the owner of the utility.

11. When notified by the Contractor that an interference or conflict has been determined to exist, the Engineer will determine whether such interference shall be considered as required by construction or as incidental to construction.

12. Where existing utility lines or structures are so located as to interfere with the Contractor's prosecution of the Work, but do not physically conflict with permanent structures to be constructed under this Contract; then any modification, alteration, or relocation of interfering utility, either permanent or temporary, shall be accomplished at the expense of the Contractor.

E. Interfering Structures

1. Take necessary precautions to prevent damage to existing structures whether on the surface, aboveground, or underground. An attempt has been made to show major structures on the Drawings. While the information has been compiled from the best available sources, its completeness and accuracy cannot be guaranteed, and it is presented as a guide to avoid known possible difficulties.

2. Protect existing structures from damage, whether they lie within the right-of-way or the limits of the easements obtained by the Owner or not. Where existing structures must be removed to conduct the Work properly, or are damaged during the Work, they shall be restored at the Contractor's own expense to at least their original condition and to the satisfaction of the Engineer.

3. The Contractor may, with the approval of the Engineer and without additional compensation, remove and replace in a condition as good as or better than original, any small interfering structures such as fences and signposts that interfere with the Contractor's operations.

F. Field Relocation

1. During the progress of the Work, minor relocations of the Work may be necessary that do not require changes in the Contract time or price. Make such relocations only at the direction of the Engineer (by Field Order). If existing structures are encountered that will prevent construction as shown, notify the Engineer before continuing with the Work in order that the Engineer may make such field revisions as necessary to avoid conflict with the existing structures. If the Contractor fails to notify the Engineer when an existing structure is encountered and proceeds with the Work despite this interference, the Contractor shall be responsible for any damage that may occur.

G. Land Monuments

1. Preserve or replace any existing federal, state, county, city, or private land monuments encountered. A land surveyor, licensed in the state where the project is located, shall replace damaged or missing monuments at the Contractor's expense.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

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SECTION 01170

SPECIAL PROVISIONS

PART 1 GENERAL

1.01 GENERAL OBLIGATIONS OF THE CONTRACTOR

A. General obligations of the Contractor shall be as set forth in the Contract Documents.

1.02 MATERIALS COMPLIANCE WITH AIS

A. P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), includes an “American Iron and Steel (AIS)” requirement in section 436 that requires Clean Water State Revolving Loan Fund (CWSRF) and Drinking Water State Revolving Loan Fund (DWSRF) assistance recipients to use iron and steel products that are produced in the United States for projects for the construction, alteration, maintenance, or repair of a public water system or treatment works. This Project meets the definition of such work, and the Environment Protection Agency (EPA) implementation requirements for this AIS requirement are outlined within the DWSRF memorandum titled “Implementation of American Iron and Steel provisions of P.L. 113-76, Consolidated Appropriations Act, 2014” included as part of the RLF Supplemental General Conditions.

B. All parties are required to comply with these requirements and to ensure that all qualifying iron and steel products used in this project must be produced in the United States. See RLF Supplemental General Conditions for additional details.

1.03 RELATED SECTIONS

A. Section 01111 – Site Conditions

B. Section 01310 – Control of Work

C. Section 01450 – Field Quality Control

D. Section 01782 – Operation and Maintenance

E. Section 02050 – Demolition and Modifications

F. Section 02370 – Erosion and Sedimentation Control

1.04 SITE INVESTIGATION

A. The Contractor shall satisfy himself as to the conditions existing within the project area, the type of equipment required to perform the work, the character, quality, and quantity of the subsurface materials to be encountered insofar as this information is reasonably ascertainable from an inspection of the site, as well as from information presented by the Drawings and Specifications. Any failure of the Contractor to acquaint himself with the available information will not relieve him from the responsibility for estimating properly

the difficulty or cost of successfully performing the work. The Owner assumes no responsibility for any conclusions or interpretation made by the Contractor based on the information made available by the Owner.

1.05 COORDINATION WITH CITY AGENCIES

A. The Contractor will be required to reimburse the City for the actual cost of the services of Public Utility Department Personnel required by him during other than regular working hours.

B. The Contractor is responsible for obtaining all site grading, building and demolition permits. The Contractor will be responsible for requesting all building inspections, including structural, electrical, mechanical, and plumbing, during the course of the project. All permit fees will be waived.

1.06 SERVICES OF MANUFACTURERS' REPRESENTATIVE AND OPERATION MANUALS

A. Bid prices for equipment shall include the cost of a competent representative of the manufacturers of all equipment to supervise the installation, adjustment, and testing of the equipment and to instruct the Owner's operating personnel in operation and maintenance. This supervision may be divided into two or more time periods as required by the installation program or as directed by the Engineer.

B. See the detailed Specifications for additional requirements for furnishing the services of manufacturer's representatives.

C. A certificate from the manufacturer stating that the installation of the equipment is satisfactory, that the unit has been correctly and satisfactorily tested, is ready for operation, that the operating personnel have been suitably instructed in the operation, lubrication, and care of the unit shall be submitted and accepted by the Engineer prior to substantial completion.

D. Operation and Maintenance manuals shall be submitted in accordance with Specification Sections 01300, Submittals, and 01782, Operation and Maintenance Data.

1.07 GREASE, OIL AND FUEL

A. All grease, oil and fuel required for the testing of equipment shall be furnished with the respective equipment. The Owner shall be furnished with a year’s supply of the required lubricants including grease and oil of the type recommended by the manufacturer with each item of equipment supplied under Divisions 11, 13, 14, and 15. All lubricant containers shall be labeled with the manufacturer’s name.

1.08 TOOLS

A. Any special tools (including grease guns or other lubricating devices) which may be necessary for the adjustment, operation, and maintenance of any equipment shall be furnished with the respective equipment. All tools shall be cataloged and packed with labels to identify the appropriate equipment for which they are intended. A packing and delivery list shall be provided to the Engineer and the tools shall be available for inventory at project completion.

B. Tools shall be furnished in suitable large toolboxes.

1.09 POWER SUPPLY

A. Unless otherwise specified, all motors 3/4 hp and larger shall be designed for power supply of 480 volts, 3 phase, 60 hertz; and all motors 1/2 hp and smaller shall be designed for a power supply of 120 volts, single phase, 60 hertz.

1.10 MAINTAINING EXISTING ELECTRICAL SERVICE

A. The Owner shall coordinate existing and new electrical services with the serving electrical power provider. All costs for the providing of new services and relocation of facilities shall be the responsibility of the Owner. All costs for providing temporary services shall be included in the Contractor’s bid.

1.11 MAINTENANCE AND LUBRICATION SCHEDULES

A. The Contractor's attention is directed to Section 01300, Submittals, for all requirements relative to the submission of shop and working drawings for the mechanical equipment. For all mechanical and electrical equipment furnished, the Contractor shall provide a list including the equipment name, and address and telephone number of the manufacturer's representative and service company so that service and/or spare parts can be readily obtained. In addition, a maintenance and lubrication schedule for each piece of equipment shall be submitted along with shop drawings. Submission shall be in a minimum of seven (7) copies.

1.12 SHIPMENT AND DELIVERY OF EQUIPMENT

A. Equipment shall not be shipped until approved by the Engineer. The intent of this requirement is to reduce site storage time prior to installation and/or operation. Under no circumstances shall equipment be delivered to the site more than two (2) months prior to anticipated installation without written authorization from the Engineer.

B. During shipment and delivery, the following procedures shall apply:

1. All parts shall be properly protected so that no damage or deterioration will occur during a prolonged delay between time of shipment and installation, including any prolonged period at the site.

2. Factory assembled parts and components shall not be disassembled for shipment unless permission is received in writing from the Engineer.

3. Finished surfaces of all exposed parts shall be properly protected against adverse conditions that may prevail from time of shipment until ready for operation.

4. All finished surfaces of all exposed flanges shall be protected by wooden blank flanges, stoutly built, and securely bolted.

5. Finished iron and steel surfaces not painted shall be protected against rust and corrosion.

6. After hydrostatic or other tests, all entrapped water shall be drained, and care taken to prevent the entrance of water during shipment, storage, and handling.

7. Each box or package shall be legibly marked to show its net weight and contents.

8. At the time of shipment, the shipping list, original bill of lading, shipping memorandum, and invoice shall be mailed in triplicate to the Engineer. Each shipping list shall give the description and net weight of each item, and gross weight of the shipment. Shipment will not be accepted until the list has been received.

9. Demurrage, or other charges resulting from failure to furnish these items shall be absorbed by the Contractor.

10. The Contractor shall make suitable provision for the handling and delivery of all equipment and material at the site.

1.13 STORAGE AND HANDLING OF EQUIPMENT ON SITE

A. Special attention shall be given to the storage and handling of equipment on site. At a minimum, the procedure outlined below shall be followed:

1. All equipment having moving parts such as gears, electric motors, etc., and/or instruments shall be stored in a temperature and humidity-controlled building approved by the Engineer, until such time as the equipment is to be installed.

2. All equipment shall be stored fully lubricated with oil, grease, etc., unless otherwise instructed by the manufacturer.

3. Manufacturer's storage instructions shall be carefully studied by the Contractor and reviewed with the Engineer by him. These instructions shall be carefully followed and a written record of this kept by the Contractor.

4. Moving parts shall be rotated a minimum of once weekly to ensure proper lubrication and to avoid metal-to-metal "welding". Upon installation of the equipment, the Contractor shall start the equipment, at least half load, once weekly for an adequate period of time to ensure that the equipment does not deteriorate from lack of use.

5. Lubricants shall be changed upon completion of installation and as frequently as required thereafter during the period between installation and acceptance. New lubricants shall be put into the equipment at the time of acceptance.

6. Prior to acceptance of the equipment, the Contractor shall have the manufacturer inspect the equipment to certify that its condition has not been detrimentally affected by the long storage period. Such certification by the manufacturer shall be deemed to mean that the equipment is judged by the manufacturer to be in a condition equal to that of equipment that has been shipped, installed, tested, and accepted in a minimum time period. As such, the manufacturer will guarantee the equipment equally in both instances. If such a certification is not given, the equipment shall be judged to be defective. It shall be removed and replaced at the Contractor's expense.

1.14 INSTALLATION OF EQUIPMENT

A. Special care shall be taken to ensure proper alignment of all equipment with particular reference to the pumps and electric drives. The units shall be carefully aligned on their foundations by qualified millwrights after their sole plates have been shimmed to true alignment at the anchor bolts. The anchor bolts shall be set in place and the nuts tightened against the shims. After the foundation alignments have been approved by the Engineer, the bedplates or wing feet of the equipment shall be securely bolted in place. The alignment of equipment shall be further checked after securing to the foundations, and after confirmation of all alignments, the sole plates shall be finally grouted in place. The Contractor shall be responsible for the exact alignment of equipment with associated piping, and under no circumstances will "pipe springing" be allowed.

B. All wedges, shims, filling pieces, keys, packing, grout, or other materials necessary to properly align, level and secure apparatus in place shall be furnished by the Contractor. All parts intended to be plumb, or level must be proven exactly so. Perform all grinding necessary to bring parts to proper bearing after erection.

1.15 SLEEVES AND OPENINGS

A. The Contractor shall provide all openings, channels, chases, etc. in new construction and furnish and install anchor bolts and other items to be embedded in concrete, as required to complete the work under this Contract. The Contractor shall do all cutting, coring, and rough and finish patching required in existing construction for the work of all trades.

B. Subcontractors shall furnish all sleeves, inserts, hangers, anchor bolts, etc. required for the execution of their work. It shall be their responsibility before the work of the Contractor is begun to furnish him/her with the above items and with templates, drawings or written information covering chases, openings, etc. which they require and to follow up the work of the Contractor as it progresses, making sure that their drawings and written instructions are followed. Failing to do this, they shall be responsible for the cost of any corrective measures which may be required to provide necessary openings, etc. If the Contractor fails to follow the directions given him/her, covering details and locations of openings, etc., he/she shall be responsible for any cutting and refinishing required to make the necessary corrections. In no case shall beams, lintels, or other structural members be cut without the approval of the Engineer.

1.16 PIPE MARKING

A. Pipe marking is included in Division 09 under Painting, but it shall be the Contractor's responsibility to assist, as required by the Engineer, in identifying pipe contents, direction of flow and all else required for proper marking of pipe.

1.17 VALVE IDENTIFICATION

A. The Contractor shall prepare a valve schedule for all valves required for the Work showing a number, the location, type, function, and normal operating position for each valve. The schedule shall be submitted to the Engineer for approval not less than 120 days prior to start-up.

B. The Contractor shall furnish tags for all valves required for the Work. Valve tags shall be 2 inch diameter, 19-gauge, brass or plastic, with brass hooks suitable for attaching the tag to the valve operator. Tags shall be stamped or etched with the valve number and the information on the valve schedule coded in a system provided by the Owner. Submit two samples of the type of tag proposed and the manufacturer's standard color chart and letter styles to the Engineer for approval.

C. The Contractor shall install valve tags on all valves required for the Work.

1.18 NOISE LIMITATIONS

A. All equipment to be furnished under this Contract, unless specified otherwise in the technical specifications, shall be designed to ensure that the sound pressure level does not exceed 85 decibels over a frequency range of 37.8 to 9,600 cycles per second at 3-foot distance from any portion of the equipment, under any load condition, when tested using standard equipment and methods. Noise levels shall include the noise from the motor. Mufflers or external baffles shall not be acceptable for the purpose of reducing noise. Data on noise levels shall be included with the shop drawing submittal.

1.19 SPARE PARTS

A. Spare parts for certain equipment have been specified in the pertinent Sections of the Specifications. The Contractor shall collect and store all spare parts so required in an area to be designated by the Engineer. In addition, the Contractor shall furnish to the Engineer an inventory listing all spare parts, the equipment they are associated with, the name and address of the supplier and the delivered cost of each item. Copies of actual invoices for each item shall be furnished with the inventory to substantiate the delivery cost.

B. Spare parts shall be packed in cartons, properly labeled with indelible markings with complete descriptive information including manufacturer, part number, part name and equipment for which the part is to be used and shall be properly treated for one (1) year of storage.

1.20 WEATHER PROTECTION

A. In the event of inclement weather, the Contractor shall protect the Work and materials from damage or injury from the weather. If, in the opinion of the Engineer, any portion of the Work or materials has been damaged by reason of failure on the part of the Contractor to so protect the Work, such Work and materials shall be removed and replaced with new materials and Work to the satisfaction of the Engineer.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01171

ELECTRIC MOTORS

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Motors up to 200-horsepower (hp) furnished under other Sections shall be in conformance with the requirements listed in this Section, unless otherwise noted.

B. Motors connected to variable frequency drive controllers shall be inverter duty rated.

C. The project will replace eight (8) 60HP aeration rotor motors and replace them with eight (8) 75HP motors. The existing motors are Techtop Model GR3-CI-364T-4-BR-D-60, 60HP, 1775RPM, TEFC, 364T Frame. The motors are installed on a 364G2 adjustable motor base grouted into the aerator rotor alcove base slab. Half of the motors are NEMA F1 assembly, and half are NEMA F2 assembly. The proposed motors shall be equal to Toshiba Model 0754SDSR41A-P3, 75HP, 1780RPM, TEFC, 365T Frame, NEMA F3 Assembly. The proposed motor must have dual NEMA 364T/365T base mounting holes, such that the 365T motor will mount onto the existing 364G2 adjustable motor base. The proposed motor must be NEMA F3 construction with motor conduit box on top of the motor, allowing the junction box to be rotated fully in 90-degree increments for conduit entry. NEMA F1 and NEMA F2 conduit box locations are not allowed. The proposed motor must have an overall length (NEMA C dimension) no more than 33.0”. The proposed motor bearing system must be rated for belt loading. The proposed motor must be NEMA Design B with a 1.15 service factor rating.

D. The Contractor shall provide one (1) spare motor for the aeration rotor motors in addition to the eight (8) installed units.

1.02 MATERIALS COMPLIANCE WITH AIS

A. P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), includes an “American Iron and Steel (AIS)” requirement in section 436 that requires Clean Water State Revolving Loan Fund (CWSRF) and Drinking Water State Revolving Loan Fund (DWSRF) assistance recipients to use iron and steel products that are produced in the United States for projects for the construction, alteration, maintenance, or repair of a public water system or treatment works. This Project meets the definition of such work, and the Environment Protection Agency (EPA) implementation requirements for this AIS requirement are outlined within the DWSRF memorandum titled “Implementation of American Iron and Steel provisions of P.L. 113-76, Consolidated Appropriations Act, 2014” included as part of the RLF Supplemental General Conditions.

B. All parties are required to comply with these requirements and to ensure that all qualifying iron and steel products used in this project must be produced in the United States. See RLF Supplemental General Conditions for additional details.

1.03 RELATED SECTIONS

A. Section 01300 – Submittals

B. Section 01600 – Materials, Transportation and Handling

C. Section 01782 – Operation and Maintenance Data

D. Section 01783 – Product Warranties

E. Section 16000 – Electric General Provisions

F. Section 16490 – Variable Frequency Drives – Free Standing

1.04 REFERENCE STANDARDS

A. Institute of Electrical and Electronics Engineers (IEEE)

B. National Electrical Code (NEC)

C. National Electrical Manufacturers Association (NEMA)

D. Underwriters Laboratories, Inc. (UL)

E. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.05 SUBMITTALS

A. Submittal of motor data for acceptance shall be in accordance with Specification Section 01300, Submittals, and shall include complete nameplate data and test characteristics in accordance with the latest version of NEMA Standard MG1-12. In addition, the following data for the motors shall be provided:

1. Efficiency at 1/2, 3/4, and full load
2. Power factor at 1/2, 3/4, and full load
3. Motor outline drawings, dimensions, and weight
4. Descriptive bulletins, including full description of insulation system
5. Bearing design data and L-10 bearing life
6. Special features (i.e., space heaters, temperature detectors, etc.)
7. Power factor correction capacitor rating and type
8. Insulation information
9. Locked Rotor Amperes at rated voltage and NEMA starting code letter
10. Temperature rise
11. Service factor

B. Operations and maintenance data is specified under paragraph 1.09 of this Specification Section.

1.06 QUALITY ASSURANCE

A. Routine tests shall be performed on representative motors and shall include the information described on NEMA MG1-12. Efficiency shall be determined in accordance with IEEE Publication No. 112, Method B. Power factor shall be measured on representative motors.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Delivery, storage, and handling of motors shall be in accordance with Specification Section 01600, Materials, Transportation and Handling.

1.08 SYSTEM DESCRIPTION

A. Motors specified herein are three-phase, squirrel-cage induction type for 3/4-hp and above; single-phase for less than 3/4-hp; or DC motors.

1.09 PROJECT/SITE REQUIREMENTS

A. Ambient temperature at job site range from 0 to 110 degrees Fahrenheit (0 to 110°F).

1.10 MAINTENANCE

A. Provide operation and maintenance data in accordance with Specification Section 01782, Operation and Maintenance Data, and Specification Section 16000, Electrical General Conditions.

1.11 WARRANTY

A. All equipment supplied under this Section shall be warranted by the Contractor and the equipment manufacturers for a period of two (2) years from startup, in accordance with Section 01783, Product Warranties.

PART 2 PRODUCTS

2.01 RATING

A. Each motor shall develop ample torque for its required service throughout its acceleration range at a voltage ten percent (10%) below nameplate rating.

B. The motor shall not be required to deliver more than its rated nameplate horsepower, at unity (1.0) service factor, under any condition of mechanical or hydraulic loading.

C. All motors shall be continuous time rated, suitable for operation in a 50 degrees Celsius (50°C) ambient temperature, unless noted otherwise.

D. All motors shall be continuous time rated, suitable for operation at 3,600 feet above mean sea level.

E. Specific motor data, such as horsepower, speed (rpm), enclosure type, etc., is specified under the detailed specification for the equipment with which the motor is supplied.

F. Motors connected to Variable Frequency Drive Controllers shall be inverter duty rated and conform to detailed standards outlined in NEMA MG1, Part 31, latest edition.

2.02 ENCLOSURE TYPES

A. Motors specified herein will conform to one of the following standard enclosure designs:

1. Open Drip Proof
2. Totally Enclosed Fan Cooled (TEFC)
3. Totally Enclosed Non-Ventilated (TENV)
4. Inverter Duty
5. Explosion-proof
6. Severe Duty

2.03 NAMEPLATES

A. The motor manufacturer's nameplates shall be embossed on stainless steel and fastened to the motor frame with stainless steel screws or drive pins. Nameplates shall clearly indicate all of the items of information enumerated in NEMA Standard MG1-10.39 or MG1-20.25, as applicable.

2.04 CONDENSATION HEATERS

A. Condensation heaters, where specified under the detailed mechanical specifications, shall be of the cartridge or flexible wrap-around type installed within the motor enclosure adjacent to core iron. Heaters shall be rated for 120-V, single-phase with wattage as required to maintain internal temperature rise of 5 to 10°C above ambient during periods of shut- down. The heater wattage and voltage shall be embossed on the motor nameplate. Power leads for heaters shall be brought out at the motor lead junction box.

2.05 WINDING TEMPERATURE DETECTORS

A. All motors shall be provided with winding temperature detectors. Winding temperature detectors shall be a factory-installed, embedded, bi-metallic switch type, one per phase, with leads terminating in the main conduit box. This device shall protect the motor against damage from overheating caused by single-phasing, overload, high ambient temperature, abnormal voltage, locked rotor, frequent starts, or ventilation failure. The switch shall have normally closed contacts. Not less than three detectors shall be furnished with each motor.

B. Motors connected to variable frequency drives shall be equipped with winding temperature detectors, in accordance with paragraph 2.05.A of this Specification Section.

2.06 SINGLE-PHASE MOTORS

A. Unless otherwise specified, motors smaller than 3/4 hp shall be single-phase, capacitor start. Small fan motors may be split phase or shaded pole type if such are standard for the equipment. Wound rotor or commutator type single-phase motors are not acceptable unless their specific characteristics are necessary for the application.

B. Motors shall be rated for operation at 115-V, single-phase, 60-Hz.

C. Locked rotor current shall not be greater than specified in NEMA Standard MG1-12.33, Design "N".

D. Motors shall be totally enclosed in conformance with NEMA Standard MG1. Small fan motors may be open type if suitably protected from moisture, dripping water, and lint accumulation.

E. Motors shall be provided with sealed ball bearings lubricated for 10 years' normal use.

2.07 THREE-PHASE MOTORS - FRAMES 143T THROUGH 449T

A. General

1. Unless otherwise specified, motors 3/4 hp and larger shall be three-phase, squirrel-cage induction type.

2. All motors 3/4 hp and larger shall be a NEMA frame 143T or larger. 1/2-hp motors and 3/4-hp motors rated 1800 and 3600 rpm shall be a 56 frame. Motors 3/4-hp and larger shall be designed and connected for operation on a 480-V, three-phase, 60-Hz alternating current system. Dual voltage (230/460) rated motors are acceptable.

3. Unless otherwise required by the load, all motors shall be NEMA Design B, normal starting torque. Locked rotor kVA/hp shall not exceed Code Letter G as described in NEMA Standard MG1-10.37 for motors 20 hp and larger.

4. Motors shall be by U.S. Electrical Motors, Division of Emerson Electric Co. or equal.

B. Bearings

1. Anti-friction motor bearings shall be designed to be re-greaseable and initially shall be filled with grease suitable to ambient temperature of 50°C. Bearings shall be ABMA, Type BT, TS, or RN, heavy-duty, or shall otherwise be shown to be suitable for the intended application in terms of L-10 rating life or better.

2. All greased lubricated bearings, except those specified to be factory-sealed and lubricated, shall be fitted with easily accessible grease supply, flush, drain, and relief fittings. Extension tubes shall be used when necessary. Grease supply fittings shall be standard hydraulic type by the Alemite Division of the Stewart-Warner Corporation.

C. Insulation

1. Insulation systems shall be Class F, operated at Class B temperature rise as measured by resistance based on a 50°C ambient temperature, and shall be manufacturer's premium grade, resistant to attack by moisture, acids, alkalis, and mechanical or thermal shock for 480V motors.

2. Motors shall have vacuum/pressure impregnated epoxy insulation for moisture resistance.

3. Insulation for inverter duty motor windings shall meet or exceed the Pulse Endurance Index for magnetic wire and shall not be injured when exposed to repeated pulse type waveforms, repetitive high-voltage transients, switching frequency, and rate of rise of the pulse. Class H varnish shall be used.

D. Enclosures

1. Motors shall have a steel or cast-iron frame and a cast iron or stamped steel conduit box, as specified below. Conduit box shall be split from top to bottom and shall be capable of being rotated to four (4) positions. Synthetic rubber-like gaskets shall be provided between the frame and the conduit box and between the conduit box and its cover. Motor leads shall be sealed with a non-wicking, non-hygroscopic insulating material. A frame-mounted pad with drilled and tapped hole, not less than 1/4-in diameter, shall be provided inside the conduit box for motor frame grounding.

   a. Totally enclosed fan cooled: TEFC motors shall have a steel or cast-iron frame, cast iron end brackets, cast iron conduit box, 1.15 service factor at 50°C, tapped drain holes (corrosion-resistant plugs for frames 286T and smaller, and automatic breather/drain devices for frames 324T and larger), and upgraded insulation by additional dips and bakes to increase moisture resistance.

   b. Totally enclosed non-ventilated: TENV motors shall include the same rating and accessories as specified for TEFC motors.

   c. Explosion-proof: Explosion-proof motors shall have a cast iron frame, cast iron end brackets, cast iron conduit box, 1.15 service factor at 50°C, tapped drain holes (corrosion-resistant plugs for frames 286T and smaller, and automatic breather/drain devices for frames 324T and larger), and be Underwriters Laboratories Inc. (UL) listed for Class 1, Div. 1, Group D hazardous areas.

   d. Severe duty: Motors shall be of the corrosion-resistant type conforming to motors designated by the manufacturer as "Corro-Duty", "Mill and Chemical", "Custom Severe Duty", or similar quality designation. Severe-duty motors shall have a cast iron frame, cast iron end brackets, cast iron conduit box and 1.15 service factor at 50 degrees C, and tapped drain holes (corrosion-resistant plug for frames 286T and smaller, and automatic breather/drain devices for frames 324T and larger).

E. Inverter Duty Rated Motors

1. Inverter duty rated: Motors for operation on variable frequency drives shall meet current power quality levels published in NEMA MG1, Part 31, latest edition. Consideration shall be given to the primary factors of the variable frequency drive, such as the modulation scheme (six-step, PWM, etc.), the switching or carrier frequency, and the type of power output devices utilized (IGBT, etc.). Consideration shall also be given to the installation methods, such as output cable length, cable installation method, installation of output filters, etc. Motor shaft and bearings shall be insulated. Internal service factor shall be 1.0 that of the nameplate. Unless

otherwise noted, provide enclosures suitable for "severe duty". Ventilation system shall be designed for maximum heat transfer. Stator laminations shall be stagger-stacked and stamped from high-grade electrical steel to minimize eddy-current losses and heat build-up caused by inverter induced harmonics. Rotors shall be configured to minimize skin-effect heating.

F. Motor Efficiencies

1. Three-phase motors rated one (1) horsepower and larger shall be premium efficiency and shall conform to the nomenclature identified as “NEMA PREMIUM”. Motors shall carry the NEMA PREMIUM nameplate. Motors shall have a NEMA Nominal Efficiency not less than the values indicated by NEMA PREMIUM product. Efficiency values shall be based on tests performed in accordance with IEEE Publication No. 112, Method B. Motors with horsepower or speed not listed shall conform to comparable standards of construction and materials as those for listed motors.

G. Power Factor Correction Capacitors

1. All single-speed motors over five horsepower (except motors powered from variable frequency drives) shall be provided with a heavy-duty industrial-type power factor correction capacitor selected, recommended, and furnished by the motor manufacturer to raise the motor power factor to approximately 90 percent (90%). For non-explosion-proof motors, the capacitor shall be mounted on the equipment base plate adjacent to the motor and shall be connected to the motor junction box with liquid-tight flexible conduit. For explosion-proof motors, the capacitors shall be wall-mounted in a non-hazardous area.

2. Capacitors shall be dry film or liquid insulated and shall be hermetically sealed in steel enclosures.

3. Each capacitor unit shall be furnished with three high interrupting capacity current limiting fuses. Fuses shall be equipped with "blown-fuse" indicators.

4. Capacitor enclosures shall be suitable for conduit connection. Covers shall be gasketed, bolt-on type.

5. Capacitors shall be UL listed.

6. Capacitors shall be by General Electric Co., Square D Co., or approved equal.

2.08 SHOP TESTING

A. All motors shall be given a routine test per NEMA MG1 standard, and test results shall be submitted to Engineer.

B. Maximum vibration allowed shall be 0.15 inches per second velocity measured at the bearing housings.

C. Rotor shaft extension run out shall not exceed:

1. 0.002” TIR for shaft diameter 0.1875 - 1.625 inches
2. 0.001" TIR for shaft diameter over 1.625 - 6.500 inches

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01300

SUBMITTALS

PART 1 GENERAL

1.01 SCOPE OF WORK

A. This Section specifies the general methods and requirements of submissions applicable to Shop Drawings, Materials and Product Data, Test Results, Samples, Permits, and Construction or Submittal Schedules. Additional general submission requirements are contained the General Conditions. Detailed submittal requirements are specified in the technical sections.

B. Clearly identify all submittals by reference to Section Number, Paragraph, Drawing Number or Detail as applicable. Submittals shall be clear and legible and of sufficient size for presentation of data.

1.02 MATERIALS COMPLIANCE WITH AIS

A. P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), includes an “American Iron and Steel (AIS)” requirement in section 436 that requires Clean Water State Revolving Loan Fund (CWSRF) and Drinking Water State Revolving Loan Fund (DWSRF) assistance recipients to use iron and steel products that are produced in the United States for projects for the construction, alteration, maintenance, or repair of a public water system or treatment works. This Project meets the definition of such work, and the Environment Protection Agency (EPA) implementation requirements for this AIS requirement are outlined within the DWSRF memorandum titled “Implementation of American Iron and Steel provisions of P.L. 113-76, Consolidated Appropriations Act, 2014” included as part of the RLF Supplemental General Conditions.

B. All parties are required to comply with these requirements and to ensure that all qualifying iron and steel products used in this project must be produced in the United States. See RLF Supplemental General Conditions for additional details.

1.03 SCHEDULING

A. Coordination of Submittal Times: Prepare and transmit each submittal sufficiently in advance of performing the related work or other applicable activities, or within the time specified for the associated work of other related Sections. The Work shall not be delayed by processing times and issues involving the following: disapproval and resubmittal (if required); coordination with other submittals; or for testing, purchasing, fabrication, delivery, and similar sequenced activities. No extension of time will be authorized because of the Contractor's failure to transmit submittals sufficiently in advance of the Work.

PART 2 PRODUCTS

2.01 SHOP DRAWINGS, MATERIALS AND PRODUCT DATA, SAMPLES

A. Shop Drawings

1. Shop drawings as specified in individual Sections include: custom-prepared data such as fabrication and erection or installation drawings, scheduled information, setting diagrams, actual shop work manufacturing instructions, custom templates, special wiring diagrams, coordination drawings, individual system or equipment inspection reports, and test reports including performance curves and certifications.

2. All shop drawings submitted by subcontractors shall be sent directly to the Contractor for checking. The Contractor shall be responsible for their submission at the proper time so as to prevent delays in delivery of materials.

3. Check all subcontractor's shop drawings regarding measurements, size of members, materials and details to make sure that they conform to the intent of the Drawings and related Sections. Return shop drawings found to be inaccurate or otherwise in error to the subcontractors for correction before submission to the Engineer.

4. All details on shop drawings shall show clearly the relation of the various parts to the main members and lines of the structure; and where correct fabrication of the work depends upon field measurements, such measurements shall be made and noted on the drawings before being submitted.

5. Submittals for equipment specified under Divisions 16 shall include a listing of all installations where identical or similar equipment has been installed and been in operation for a period of at least one (1) year.

6. All shop drawing submittals shall include the manufacturer's certifications for compliance with AIS in accordance with P.L. 113-76, Consolidated Appropriations Act, 2014 (Act).

B. Materials and Product Data

1. Submit material data in accordance with the individual specification sections. When required, furnish test data to indicate material and installation compliance with the appropriate specification or standard. Materials requiring certification include, but are not limited to the following: select material, topsoil, sand, rock, crushed stone, concrete, grout, slurry, metals, etc. Compliance or certification statements may include manufacturer's printed statements of compliances and applicability; production or quality control inspection/test reports; certifications; mill reports; and long and short-term storage instructions.

2. Submit product data in accordance with the individual specification sections. Product data shall include, but not be limited to the following: standard prepared manufacturer’s product data (sometimes referred to as catalog data or cut sheets); manufacturer's product specification and installation instructions; availability of colors, patterns and materials; manufacturer's printed statements of compliances

and applicability; roughing-in diagrams and templates; 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; long and short term storage instructions; recommended spare parts listings; and printed product warranty documentation.

3. In addition to the list of recommended spare parts, submit a separate list of spare parts that will be provided by the manufacturer with the equipment, as required by the individual equipment specifications. During the startup of the equipment, the manufacturer's representative, in coordination with the Contractor, shall verify that all required spare parts have been delivered to the project site and are in satisfactory condition for use by the Owner. At Final Completion, compile two (2) copies of each required (delivered) spare parts list and deliver such to the Owner. Organize the spare parts lists into an orderly sequence based on the table of contents of the Project Manual and include the number of parts delivered and the part number of each.

C. Samples

1. Samples specified in individual specification sections shall be provided which give the Engineer a representation of the material textures, quality, color, and properties to be supplied for the project. Other sample requirements include 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 Engineer or Owner for independent inspection and testing.

2.02 PERMITS

A. Construction and Environmental Permits

1. Submit permits in accordance with the contract documents or in individual technical specification sections. When required, furnish copies of permits from governmental agencies for the following: demolition permits, street closure and crossing permits, highway and railroad permits, environmental permits, building permits, grading permits, blasting permits, and safety permits.

2.03 PROFESSIONAL ENGINEER (P.E.) CERTIFICATION FORM

A. If specifically required in other related Sections, submit a State of Arkansas P.E. Certification for each item required, in the form attached to this Section, completely filled in and stamped.

PART 3 EXECUTION

3.01 CONTRACTOR'S RESPONSIBILITIES

A. Review shop drawings, product data and samples, including those by subcontractors, prior to submission to determine and verify the following:

1. Conformance of materials and equipment with related Sections
2. Equipment (or field) measurement
3. Equipment (or field) construction criteria
4. Catalog numbers and similar data

3.02 SUBMISSION REQUIREMENTS

A. Make submittals promptly in accordance with approved schedule and in such sequence as to cause no delay in the Work or in the work of any other subcontractor.

B. Each submittal, appropriately coded, will be returned within 20-business days following receipt of submittal by the Engineer.

C. Electronic Copies: Provide one (1) electronic copy (scanned PDF file) of each shop drawing, structural drawing, and material and product data sheets to the Engineer. Include Contractor’s submittal cover sheet and certification statement in electronic copy.

D. Number of submittals required:

1. Shop Drawings: One (1) electronic copy

2. Structural Drawings: One (1) reproducible quality copy (when requested by the Engineer)

3. Material and Product Data: One (1) electronic copy

4. Samples: Submit the number stated in the respective Sections

E. Submittals shall contain:

1. The dates of receipt by the Contractor and submission to the Engineer, and the dates of any previous submissions

2. The Project title and number

3. Contractor identification

4. The names of the Contractor, Supplier and Manufacturer

5. Identification of the product, with the section number, page, and paragraph(s)

6. Equipment (or field) dimensions, clearly identified as such

7. Relation to adjacent or critical features of the work or materials

8. Applicable standards, such as ASTM or Federal Standards numbers

9. Identification of deviations from Contract Documents

10. Identification of revisions on resubmittals

11. A 4-inch by 8-inch (4" x 8") blank space for Contractor and Engineer stamps

12. Where calculations are required to be submitted by the Contractor, the calculations shall have been checked by a qualified individual other than the preparer. The submitted calculations shall clearly show the names of the preparer and of the checker.

F. Affix the following Certification Statement to each submittal, along with the Contractor's Company name and signature of the Contractor:

1. "Certification Statement: By this submittal, I hereby represent that I have determined and verified all equipment (or field) measurements, equipment (or field) construction criteria, materials, dimensions, catalog numbers and similar data, and I have checked and coordinated each item with other applicable approved shop drawings and all Contract requirements."

G. Shop drawings and product data sheets 11 by 17-inch (11"x 17") and smaller shall be electronically bound together in an orderly fashion by specification section and bear the above Certification Statement on the cover sheet. The cover sheet shall fully describe the packaged data and include a listing of all items within the package. Provide to the Resident Project Representative a copy of each transmittal sheet for shop drawings, product data and samples at the time of submittal to the Engineer.

H. Utilize a 10-character submittal identification numbering system in the following manner:

1. The first character shall be a D, S, P or M: which represents Shop/Working Drawing and other Product Data (D), Sample (S), Preliminary Submittal (P) or Operating/ Maintenance Manual (M).

2. The next five digits shall be the applicable specification Section Number.

3. The next three digits shall be the numbers 001 to 999, which shall sequentially number each initial separate item or drawing submitted under each specific Section Number.

4. The last character shall be a letter, A to Z, indicating the submission, or resubmission of the same Drawing, i.e., A = 1st submission, B = 2nd submission, C = 3rd submission, etc. A typical submittal number would be as follows:

D-03300-008-B

D	= Shop Drawing
03300	= Specification Section for Concrete
008	= The eighth initial submittal under this section
B	= The second submission (first resubmission) of that particular shop drawing

I. Notify the Engineer in writing, at the time of submittal, of any deviations in the submittals from the requirements of the Contract Documents.

J. The review and approval of shop drawings, samples or product data by the Engineer shall not relieve the Contractor from the responsibility of fulfilling the terms of the Contract. All risks of error and omission are assumed by the Contractor, and the Engineer will have no responsibility therefor.

K. No portion of the work requiring a shop drawing, sample, or product data shall be started nor shall any materials be fabricated prior to the approval or qualified approval of such item. Fabrication performed or materials purchased that do not conform to approved shop drawings and data shall be at the Contractor's risk. The Owner will not be liable for any expense or delay due to corrections or remedies required to accomplish conformity.

L. Project work, materials, and fabrication shall conform to approved shop drawings, applicable samples, and product data.

3.03 REVIEW OF SHOP DRAWINGS, PRODUCT DATA, WORKING DRAWINGS AND SAMPLES

A. The review of shop drawings, data and samples will be for general conformance with the design concept and Contract Documents. They shall not be construed:

1. As permitting any departure from the Contract requirements

2. As relieving the Contractor of responsibility for any errors, including details, dimensions, and materials

3. As approving departures from details furnished by the Engineer, except as otherwise provided herein

B. The Contractor remains responsible for details and accuracy, for coordinating the work with all other associated work and trades, for selecting fabrication processes, for techniques of assembly, and for performing work in a safe manner.

C. If the shop drawings, data, or samples as submitted describe variations and show a departure from the Contract requirements, which Engineer finds to be in the interest of the Owner and to be so minor as not to involve a change in Contract Price or Contract Time, the Engineer may return the reviewed drawings without noting an exception.

D. The Engineer will provide review notations and comments, as appropriate, and submittals will be returned to the Contractor under one of the following codes:

Code 1 – "NO EXCEPTIONS NOTED" is assigned when there are no notations or comments on the submittal. When returned under this code the Contractor may release the equipment and/or material for manufacture.

Code 2 – " COMMENTS 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.

Code 3 – "COMMENTS NOTED/CONFIRM" is assigned when a confirmation of the notations and comments is required by the Contractor. The Contractor may release, at his own risk, the equipment or material for manufacture; however, all notations and comments must be incorporated into the final product. This confirmation shall specifically address each omission and nonconforming item that was noted. Confirmation is to be received by the Engineer within ten (10) calendar days of the date of the Engineer's transmittal requiring the confirmation.

Code 4 – "COMMENTS NOTED/RESUBMIT" is assigned when reviewer's notations and comments are extensive enough to require a resubmittal of the package. This resubmittal is to address all comments, omissions and non-conforming items that were noted. Resubmittal is to be received by the Engineer within fifteen (15) calendar days of the date of the Engineer's transmittal requiring the resubmittal.

Code 5 – "REJECTED/RESUBMIT" is assigned when the submittal does not meet the intent of the Contract Documents. The Contractor must resubmit the entire package revised to bring the submittal into conformance. It may be necessary to resubmit using a different manufacturer/vendor to meet the Contract Documents.

Code 6 – "RECEIPT ACKNOWLEDGED" is assigned to acknowledge the receipt of a submittal that is not subject to the Engineer's review and approval; and, is being filed for informational purposes only. This code is generally used in acknowledging receipt of means and methods of construction work plan, field conformance test reports, and Health and Safety plans.

E. Resubmittals will be handled in the same manner as first submittals. On resubmittals, identify all revisions made to the submittals, either in writing on the letter of transmittal, or on the shop drawings by use of revision triangles or other similar methods. The resubmittal shall clearly respond to each comment made by the Engineer on the previous submission. Additionally, direct specific attention to any revisions made other than the corrections requested by the Engineer on previous submissions.

F. The Engineer may elect not to review partial submittals and will be the only judge as to the completeness of a submittal. Submittals not complete will be returned to the

Contractor and will be considered "Rejected" until resubmitted. The Engineer may at his option provide a list or mark the submittal directing the Contractor to the areas that are incomplete.

G. Repetitive Review

1. Shop drawings and other submittals will be reviewed no more than twice at the Owner's expense. All subsequent reviews will be performed at times convenient to the Engineer and at the Contractor's expense, based on the Engineer's then prevailing rates. The Contractor shall reimburse the Owner for all such fees invoiced to the Owner by the Engineer. Submittals are required until approved.

2. Any need for more than one (1) resubmission, or any other delay in obtaining Engineer's review of submittals, will not entitle Contractor to extension of the Contract Time.

H. 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 Engineer at least seven (7) working days prior to release for manufacture.

I. When the shop drawings have been completed to the satisfaction of the Engineer, the Contractor shall carry out the manufacture of products in accordance therewith and shall make no further changes therein except upon written instructions from the Engineer.

3.04 DISTRIBUTION

A. Distribute reproductions of approved shop drawings and copies of approved product data and samples, where required, to the job site file and elsewhere as directed by the Engineer.

B. Unless directed by the Engineer, maintain one (1) copy of each approved submittal for delivery to the Owner along with Record Drawings and other Contract closeout documentation.

END OF SECTION

PROFESSIONAL ENGINEER (P.E.) CERTIFICATION FORM

The undersigned hereby certifies that he/she is a professional engineer registered in the State of Arkansas and that he/she has been employed by

_____
(Name of Contractor)

to design the Bentonville WRRF Improvements
(Insert P.E. Responsibilities)

in accordance with Specification Section _____

for the Bentonville WRRF Improvements HWEI (Project No. 2021037).

The undersigned further certifies that he/she has performed the design of the item(s) listed above in conformance with all applicable local, State and Federal codes, rules, and regulations, and that his/her signature and P.E. stamp have been affixed to all calculations and drawings used in, and resulting from, the design.

The undersigned hereby agrees to make all original design drawings and calculations available to the Owner or Owner's representative within seven (7) days following written request therefor by the Owner.

CERTIFIED BY ENGINEER:	ACKNOWLEDGED BY CONTRACTOR:
Signature Date	Signature Date
Professional Engineer's Name	Project Manager's Name
Name of Company	Name of Contractor
Address	Address

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SECTION 01310

CONTROL OF WORK

PART 1 GENERAL

1.01 SUMMARY

A. Contractor is responsible for the control of all work, including all “means and methods” of completing the Work.

1.02 MATERIALS COMPLIANCE WITH AIS

A. P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), includes an “American Iron and Steel (AIS)” requirement in section 436 that requires Clean Water State Revolving Loan Fund (CWSRF) and Drinking Water State Revolving Loan Fund (DWSRF) assistance recipients to use iron and steel products that are produced in the United States for projects for the construction, alteration, maintenance, or repair of a public water system or treatment works. This Project meets the definition of such work, and the Environment Protection Agency (EPA) implementation requirements for this AIS requirement are outlined within the DWSRF memorandum titled “Implementation of American Iron and Steel provisions of P.L. 113-76, Consolidated Appropriations Act, 2014” included as part of the RLF Supplemental General Conditions.

B. All parties are required to comply with these requirements and to ensure that all qualifying iron and steel products used in this project must be produced in the United States. See RLF Supplemental General Conditions for additional details.

1.03 RELATED SECTIONS

A. Section 01350 – Environmental Protection Procedures

B. Section 01665 – Trench Safety Requirements

C. Section 02370 – Erosion and Sedimentation Control

1.04 CONTRACTOR’S PLANT

A. Furnish Contractor’s plant and equipment that will be efficient, appropriate, and large enough to secure a satisfactory quality of work; and a rate of progress that will ensure the completion of the Work within the Contract Time. If at any time such plant appears to be inefficient, inappropriate, or insufficient for securing the quality of work required or for producing the rate of progress aforesaid, Engineer may order the Contractor to increase the efficiency, change the character, or increase the plant equipment; and the Contractor shall conform to such order. Failure of the Engineer to give such order shall in no way relieve the Contractor of his obligations to secure the quality of the work and rate of progress required.

1.05 PRIVATE LAND

A. Do not enter or occupy private land outside of easements, except by written permission of the landowner.

1.06 PIPE LOCATIONS

A. Locate pipelines substantially as indicated on the Drawings. The Engineer reserves the right to make such modifications in locations as may be found desirable to avoid interference with existing structures or for other reasons. Where fittings are noted on the Drawings, such notation is for the Contractor's convenience and does not relieve him from laying and jointing different or additional items where required.

1.07 OPEN EXCAVATIONS

A. Adequately safeguard all open excavations by providing temporary barricades, caution signs, lights, and other means to prevent accidents to persons and damage to property. The length or size of excavation will be controlled by the particular surrounding conditions but shall always be confined to the limits prescribed by the Engineer. If the excavation becomes a hazard, or if it excessively restricts traffic at any point, the Engineer may require special construction procedures such as limiting the length of the open trench and requiring that the trench shall not remain open overnight.

B. Take precautions to prevent injury to the public due to open trenches. Provide adequate light at all trenches, excavated material, equipment, or other obstacles, which could be dangerous to the public at night.

1.08 TEST PITS

A. Excavate test pits, at the direction of the Engineer, to locate underground pipelines or structures in advance of the construction. Backfill test pits immediately after their purpose has been satisfied and restore and maintain the surface in a manner satisfactory to the Engineer.

1.09 MAINTENANCE OF TRAFFIC

A. Unless permission to close a street is received in writing from the proper authority, place all excavated material so that vehicular and pedestrian traffic may be maintained at all times. If the construction operations cause traffic hazards, repair the road surface, provide temporary ways, erect wheel guards or fences, or take other measures for safety satisfactory to the Engineer.

B. Detours around construction will be subject to the approval of the Owner and the Engineer. Where detours are permitted, provide all necessary barricades and signs as required to divert the flow of traffic. Expedite construction operations while traffic is detoured. Periods when traffic is being detoured will be strictly controlled by the Owner.

C. Take precautions to prevent injury to the public due to open trenches. Night watchmen may be required where special hazards exist, or police protection provided for traffic while work is in progress. Be fully responsible for damage or injuries whether or not police protection has been provided.

D. Use of police for traffic control shall be in conformance with the requirements of the City of Bentonville, Arkansas.

1.10 CARE AND PROTECTION OF PROPERTY

A. Be responsible for the preservation of all public and private property and use every precaution necessary to prevent damage thereto. If any direct or indirect damage is done to public or private property by or on account of any act, omission, neglect, or misconduct in the execution of the work on the part of the Contractor, restore such property to a condition similar or equal to that existing before the damage was done, or make good the damage in other manner acceptable to the Engineer.

1.11 PROTECTION AND RELOCATION OF EXISTING STRUCTURES AND UTILITIES

A. Assume full responsibility for the protection of all buildings, structures, and utilities, public or private, including poles, signs, services to buildings, utilities in the street, gas pipes, water pipes, hydrants, sewers, drains, and electric and telephone cables, whether or not they are shown on the Drawings. Carefully support and protect all such structures and utilities from injury of any kind. Immediately repair any damage resulting from the construction operations.

B. Assistance will be given the Contractor in determining the location of existing services. The Contractor, however, shall bear full responsibility for obtaining all locations of underground structures and utilities (including existing water services, drain lines and sewers). Maintain services to buildings and pay costs or charges resulting from damage thereto.

C. Notify Arkansas 811 (800-482-8998) at least 48 hours (excluding Saturdays, Sundays, and Legal holidays) before commencing any excavation.

1.12 WATER FOR CONSTRUCTION PURPOSES

A. Where potable water is required in large quantity for pre-operational testing or other use, it will be provided by the Owner. For temporary installations, the Owner will install a meter at a fire hydrant on the site. In the event that the Owner installs a water main tap and meter connection, the Contractor shall be responsible for constructing all temporary and permanent water main extensions, and all work shall be approved by the Owner. Excessive or unapproved use of water will be grounds by the Owner to levee a charge for water use.

B. The express approval of the Owner shall be obtained before water is used. Waste of water shall be sufficient cause for withdrawing the privilege of unrestricted use. Hydrants shall only be operated under the supervision of the Owner's personnel.

C. The Contractor is responsible for securing non-potable water for construction of all earthwork

1.13 MAINTENANCE OF FLOW

A. Provide for the flow of sewers, drains and watercourses interrupted during the progress of the work, and immediately cart away and remove all offensive matter. Discuss the entire procedure of maintaining existing flow with the Engineer one (1) week in advance of the interruption of any flow.

1.14 COOPERATION WITHIN THIS CONTRACT

A. All firms or persons authorized to perform any work under this Contract shall cooperate with Contractor and Subcontractors or trades and assist in incorporating the work of other trades where necessary or required.

B. Cutting and patching, drilling, and fitting shall be carried out where required by the trade or subcontractor having jurisdiction, unless otherwise indicated herein or directed by the Engineer.

1.15 CLEANUP AND DISPOSAL OF EXCESS MATERIAL

A. Cleanup and site stabilization measures shall be initiated as soon as practical in portions of the site where construction activities have temporarily or permanently ceased. In no case shall site stabilization, including site restoration efforts, commence more than 14 days after construction has temporarily or permanently ceased.

B. During the course of the work, keep the site of operations as clean and neat as possible. Dispose of all residue resulting from the construction work and, at the conclusion of the work, remove and haul away any surplus excavation, broken pavement, lumber, equipment, temporary structures and any other refuse remaining from the construction operations and leave the entire site of the work in a neat and orderly condition.

C. In order to prevent environmental pollution arising from the construction activities related to the performance of this Contract, comply with all applicable Federal, State, and local laws and regulations concerning waste material disposal, as well as the specific requirements stated in this Section and in other related Sections.

D. Disposal of excess excavated material in wetlands, stream corridors and plains is strictly prohibited even if the permission of the property owner is obtained. Any violation of this restriction by the Contractor or any person employed by him will be brought to the immediate attention of the responsible regulatory agencies, with a request that appropriate action be taken against the offending parties. The Contractor will be required to remove the fill and restore the area impacted at no increase in the Contract Price.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01350

ENVIRONMENTAL PROTECTION PROCEDURES

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, and equipment, and perform all work required for the prevention of environmental pollution in conformance with applicable laws and regulations, during and as the result of construction operations under this Contract. For the purpose of this Project, environmental pollution is defined as the presence of chemical, physical, or biological elements or agents that adversely affect human health or welfare; unfavorably alter ecological balances of importance to human life; affect other species of importance; or degrade the utility of the environment for aesthetic and/or recreational purposes.

B. The control of environmental pollution requires consideration of air, water, and land, and involves management of noise and solid waste, as well as other pollutants.

C. These Specifications are intended to ensure that construction is achieved with a minimum of disturbance to the existing ecological balance between a water resource and its surroundings. These are general guidelines, and it is the Contractor's responsibility to determine and implement the specific construction techniques to meet these guidelines.

1.02 MATERIALS COMPLIANCE WITH AIS

A. P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), includes an “American Iron and Steel (AIS)” requirement in section 436 that requires Clean Water State Revolving Loan Fund (CWSRF) and Drinking Water State Revolving Loan Fund (DWSRF) assistance recipients to use iron and steel products that are produced in the United States for projects for the construction, alteration, maintenance, or repair of a public water system or treatment works. This Project meets the definition of such work, and the Environment Protection Agency (EPA) implementation requirements for this AIS requirement are outlined within the DWSRF memorandum titled “Implementation of American Iron and Steel provisions of P.L. 113-76, Consolidated Appropriations Act, 2014” included as part of the RLF Supplemental General Conditions.

B. All parties are required to comply with these requirements and to ensure that all qualifying iron and steel products used in this project must be produced in the United States. See RLF Supplemental General Conditions for additional details.

1.03 RELATED SECTIONS

A. Section 01111 – Site Conditions

B. Section 01562 – Dust Control

C. Section 01740 – Cleaning

D. Section 02050 – Demolition and Modifications

E. Section 02100 – Site Preparation

F. Section 02140 – Dewatering and Drainage

G. Section 02200 – Earthwork

H. Section 02370 – Erosion and Sedimentation Control

I. Section 02920 – Seeding

1.04 APPLICABLE REGULATIONS

A. Comply with all applicable federal, state, and local laws and regulations concerning environmental pollution control and abatement.

1.05 NOTIFICATIONS

A. When the Engineer identifies any portion of the work not in compliance with the foregoing provisions, or any other environmentally objectionable act, the Contractor shall take immediate action to correct the issue and restore any affected areas on or adjacent to the site.

B. State or local agencies responsible for verification of certain aspects of the environmental protection requirements may notify the Contractor in writing, through the Engineer, of any non-compliance with state or local requirements. After receipt of such notice from the Engineer or from the regulatory agency, the Contractor shall immediately take corrective action. When delivered to the Contractor's authorized representative at the work site, such notice shall be deemed sufficient for the purpose of non-compliance notification.

C. If the Contractor fails or refuses to comply promptly, the Owner may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to any such stop orders shall be made the subject of a claim for extension of time or for excess costs or damages by the Contractor unless it is later determined that the Contractor is complying.

1.06 PAYMENT PROCEDURES

A. The work specified in this Section shall be considered incidental to the project and payment will be included as part of the appropriate lump sum or unit price bid items indicated in the Bid Form.

PART 2 MATERIALS (NOT USED)

PART 3 EXECUTION

3.01 PROTECTION OF STREAMS

A. Exercise care to prevent, or reduce to a minimum, any damage to any stream from pollution by debris, sediment, or other material, or from the manipulation of equipment and/or materials in or near such streams. Water used for washing or processing that contains detergents, solvents or chemicals may not be discharged to a stream and must be contained and disposed of in a state-approved facility. Water that contains oils or sediments that will reduce the quality of the stream water shall not be discharged into a stream. Water from washing operations that contains no detergents or chemicals shall be diverted through a settling basin or filter before being directed into the streams, but in no circumstance may oils be released.

B. The Contractor shall not discharge water from dewatering operations directly into any live or intermittent stream, channel, wetlands, surface water or any storm sewer. Water from dewatering operations shall be treated by filtration, settling or sedimentation basins, or other approved method to reduce the amount of sediment contained in the water.

C. Take all preventative measures and procedures to avoid spillage of petroleum products and other pollutants. In the event of spillage, take prompt remedial action in accordance with a contingency action plan approved by the Arkansas Division of Environmental Quality (DEQ). Contractor shall submit two (2) copies of approved contingency plans to the Engineer.

3.02 PROTECTION OF LAND RESOURCES

A. After completion of construction, restore land resources within the project boundaries and disturbed areas outside the limits of permanent work, so that the areas will appear natural and not detract from the appearance of the Project. Confine all construction activities to construction and staging areas shown on the Drawings.

B. Outside of areas requiring earthwork for the construction of the new facilities, the Contractor shall not deface, injure, or destroy trees or shrubs, nor remove or cut them without prior approval. Do not fasten to or attach any ropes, cables, or guy wires to any existing nearby trees for anchorage unless specifically authorized by the Engineer. Where such special emergency use is permitted, first wrap the trunk with a sufficient thickness of burlap or rags over which softwood cleats shall be tied before any rope, cable, or wire is placed. The Contractor shall be responsible for any damage resulting from such use.

C. Where trees may possibly be defaced, bruised, injured, or otherwise damaged by the Contractor's equipment, dumping or other operations, protect such trees by erecting safety fencing or temporary chain link fencing around the tree at the canopy drip line. Monuments and markers shall be protected similarly before beginning operations near them.

D. Any trees or other landscape feature scarred or damaged by the Contractor's equipment or operations shall be restored as nearly as possible to its original condition. The Engineer will decide whether a method of restoration shall be used or if damaged trees shall be removed and disposed.

1. All trimming or pruning shall be performed in an approved manner by experienced workmen with saws or pruning shears. Tree trimming with axes will not be permitted.

2. Climbing ropes shall be used where necessary for safety. Trees that are to remain, both within or outside established clearing limits, that are subsequently damaged by the Contractor and are beyond saving in the opinion of the Engineer, shall be immediately removed, and replaced.

E. The Contractor shall locate storage and stockpile areas and other construction buildings on cleared portions of the job site or on areas to be cleared as shown on the Drawings. The Engineer shall approve all stockpile and storage areas, and they shall not be located within wetlands or floodplains. The preservation of the existing landscape shall be an imperative consideration in the selection of all sites and in the construction of buildings.

F. If the Contractor proposes to construct temporary roads or embankments and excavations for plant and/or work areas, submit the following for approval at least ten (10) days prior to scheduled start of such temporary work:

1. A layout of all temporary roads, excavations, and embankments to be constructed within the work area

2. Details of temporary road construction including drainage features

3. Drawings and cross sections of proposed embankments and their foundations, including a description of proposed materials

4. A landscaping drawing showing the proposed restoration of the area

G. Removal of any trees and shrubs outside the limits of existing clearing area shall be indicated on the landscaping drawing. The drawing shall also indicate location of required guard posts or barriers required to control vehicular traffic passing close to trees and shrubs to be maintained undamaged. The drawing shall provide for the obliteration of construction scars as such and shall provide for a natural appearing final condition of the area. Modification of the Contractor's approved drawings shall be made only with the written approval of the Engineer. No unauthorized road construction, excavation or embankment construction including disposal areas will be permitted.

H. Remove all signs of temporary construction facilities such as haul roads, work areas, structures, foundations of temporary structures, stockpiles of excess of waste materials, or any other vestiges of construction as directed by the Engineer. It is anticipated that excavation, filling, and grading of roadways will be required to restore the area to near natural conditions, which will permit the growth of vegetation thereon. The disturbed areas shall be prepared and seeded as described in Section 02920, Seeding, or as approved by the Engineer.

I. All debris and excess material will be disposed of outside wetland or floodplain areas in an environmentally sound manner.

3.03 PROTECTION OF AIR QUALITY

A. Burning: The use of burning at the project site for the disposal of refuse and debris will not be permitted.

B. Dust Control: Maintain all excavations, embankment, stockpiles, access roads, plant sites, waste areas, borrow areas, and all other work areas to minimize the generation of dust that could exceed air quality standards, or which otherwise could create a hazard or nuisance to others.

C. An approved method of stabilization consisting of sprinkling or other similar methods will be permitted to control dust. The use of petroleum products and chlorides is prohibited.

D. Sprinkling, when approved, must be repeated at such intervals as to always keep all parts of the disturbed area at least damp, and the Contractor must have sufficient suitable equipment on the job to accomplish this if sprinkling is used. Dust control shall be performed as the work proceeds and whenever a dust nuisance or hazard occurs, as determined by the Engineer.

E. The Owner shall not be responsible for the providing of water used for dust control.

3.04 TRASH REMOVAL – See Specification Section 01740, Cleaning.

3.05 MAINTENANCE OF POLLUTION CONTROL FACILITIES DURING CONSTRUCTION

A. During the life of this Contract, maintain all facilities constructed for pollution control if the operations creating the particular pollutant are being carried out or until the material concerned has become stabilized to the extent that pollution is no longer being created.

3.06 NOISE CONTROL

A. The Contractor shall make every effort to minimize noises caused by construction operations. Equipment shall be equipped with silencers or mufflers designed to operate with the least possible noise in compliance with federal, state, and local regulations.

3.07 LEAD AND ASBESTOS ABATEMENT (NOT USED)

END OF SECTION

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SECTION 01400

QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. References and standards

B. Quality assurance submittals

C. Mock-ups

D. Control of installation

E. Tolerances

F. Testing services

G. Manufacturers' field services

1.02 MATERIALS COMPLIANCE WITH AIS

A. P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), includes an "American Iron and Steel (AIS)" requirement in section 436 that requires Clean Water State Revolving Loan Fund (CWSRF) and Drinking Water State Revolving Loan Fund (DWSRF) assistance recipients to use iron and steel products that are produced in the United States for projects for the construction, alteration, maintenance, or repair of a public water system or treatment works. This Project meets the definition of such work, and the Environment Protection Agency (EPA) implementation requirements for this AIS requirement are outlined within the DWSRF memorandum titled "Implementation of American Iron and Steel provisions of P.L. 113-76, Consolidated Appropriations Act, 2014" included as part of the RLF Supplemental General Conditions.

B. All parties are required to comply with these requirements and to ensure that all qualifying iron and steel products used in this project must be produced in the United States. See RLF Supplemental General Conditions for additional details.

1.03 RELATED SECTIONS

A. Section 01300 – Submittals

B. Section 01450 – Field Quality Control

C. Section 01600 – Materials, Transportation and Handling

1.04 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM), latest edition:

1. ASTM C1021 Standard Practice for Laboratories Engaged in Testing of Building Sealants

2. ASTM C1077 Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation

1. ASTM C1093 Standard Practice for Accreditation of Testing Agencies for Masonry

3. ASTM D3740 Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction

4. ASTM E329 Standard Specification for Agencies Engaged in Construction Inspection and/or Testing

5. ASTM E543 Standard Practice for Agencies Performing Nondestructive Testing

1.05 SUBMITTALS

A. Testing Agency Qualifications:

1. Prior to start of Work, submit agency name, address, and telephone number, and names of full-time specialist and responsible officer.

B. Test Reports: After each test, promptly submit two copies each of report to Engineer and to Contractor. Submit an additional copy of report to Owner upon request.

1. Include:

a. Date issued
b. Project title and number
c. Name of sampling/testing technician
d. Date and time of sampling or test
e. Identification of product and specifications section
f. Location in the Project
g. Type of test
h. Date of test
i. Results of test
j. Conformance with Contract Documents
k. When requested by Engineer, provide interpretation of results

2. Test reports are submitted for Engineer’s knowledge as contract administrator or for the Owner, for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.

C. Certificates: When specified in individual specification section, submit certification by the manufacturer and Contractor or installation/application subcontractor to Engineer, in quantities specified for Product Data.

1. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.

2. Certificates may be recent or previous test results on material or product, but must be acceptable to Engineer

D. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly installation, start-up, adjusting, and finishing, for the Engineer's information and comment. Indicate special procedures, perimeter condition requiring special attention, and special environmental criteria required for application or installation.

E. Manufacturer's Field Reports: Submit reports for Engineer's benefit as contract administrator or for Owner.

1. Submit report in duplicate within 14 days of observation to Engineer for information.

2. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contact documents.

F. Erection Drawings: Submit drawings for Engineers review and comment as contract administrator.

1. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.

2. Data indicating inappropriate or unacceptable Work may be subject to action by Engineer or Owner.

1.06 REFERENCES AND STANDARDS

A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. Conform to reference standard of date of issue current on date of Agreement, except where a specific date is established by applicable code.

C. Obtain copies of standards where required by product specification sections.

D. Maintain copies at project site during submittals, planning, and progress of the specific work, until Substantial Completion.

E. Should specified reference standards conflict with Contract Documents, request clarification from Engineer before proceeding.

F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Engineer shall be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.07 TESTING AGENCIES

A. Provide the services of an independent testing agency to perform specified testing as directed in Section 01450, Field Quality Control.

B. Employment of a testing agency by the Contractor or by the Owner in no way relieves Contractor of obligation to perform Work in accordance with requirements of contract Documents.

C. Contractor Employed Agency:

1. Testing agency: Comply with requirements of ASTM C1021, ASTM C1077, ASTM C1093, ASTM D3740, ASTM E329, and ASTM E543

2. Laboratory: Authorized to operate in State in which Project is located

3. Testing Equipment: Calibrated at reasonable intervals with devices of an accuracy traceable to either National Bureau of Standards or accepted values of natural physical constants

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.

B. Comply with manufacturers' instructions, including each step in the sequence.

C. Should manufacturers' instruction conflict with Contract Documents, request clarification from Engineer before proceeding.

D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Have Work performed by persons qualified to produce required and specified quality.

F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.

G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

3.02 MOCK-UPS

A. Perform tests under provisions identified in this section and identified in the respective product specification sections.

B. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.

C. Accepted mock-ups establish a comparison standard for the remaining Work.

D. Remove mock-up and clear area when directed by Engineer and in accordance with the product specification.

3.03 TOLERANCES

A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.

B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Engineer before proceeding.

C. Adjust products to appropriate dimensions; position before securing products in place.

3.04 TESTING

A. See individual specification sections for testing required.

B. Testing Agency Duties:

1. Test samples of construction materials and mixes submitted by or collected per direction of Contractor.

2. Provide qualified personnel at site. Cooperate with Engineer and Contractor in performance of services.

3. Perform specified sampling and testing of products in accordance with specified standards.

4. Ascertain compliance of materials and mixes with requirements of contract Documents.

5. Promptly notify Engineer and Contractor of observed irregularities or non-conformance of Work or products.

6. Perform additional tests and inspections required by Engineer.

7. Submit reports of all tests specified.

C. Limits on Testing Agency Authority:

1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.

2. Agency may not approve or accept any portion of the Work.

3. Agency may not assume any duties of Contractor.

4. Agency has no authority to stop the Work.

D. Contractor Responsibilities:

1. Deliver to agency at designated location, adequate samples of materials proposed to be used that require testing, along with proposed mix designs.

2. Cooperate with laboratory personnel and provide access to the Work.

3. Provide incidental labor and facilities:

a. To provide access to Work to be tested

b. To obtain and handle samples at the site or at source of Products to be tested

c. To facilitate tests

d. To provide storage and curing of test samples

4. Notify Engineer and laboratory 24 hours (one working day) prior to expected time for operations requiring testing services.

5. Employ services of an independent qualified testing laboratory as directed by Section 01450, Field Quality Control.

E. Re-testing required because of non-conformance to specified requirements shall be performed by the same agency on instructions by Engineer. Contractor is responsible for payment of all re-testing.

3.05 MANUFACTURERS' FIELD SERVICES

A. When specified in individual specifications, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, and start-up of equipment; to test, adjust and balance equipment as applicable; and to initiate instructions when necessary.

B. Submit qualifications of observer to Engineer 30 days in advance of required observations.

1. Observer subject to approval of Engineer

C. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

3.06 DEFECT ASSESSMENT

A. Replace Work or portions of the Work not conforming to specified requirements.

B. If, in the opinion of Engineer, it is not practical to remove and replace the Work, Engineer will direct an appropriate remedy or adjust payment.

END OF SECTION

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SECTION 01420

ABBREVIATIONS

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Whenever in these Contract Documents the following abbreviations are used, the intent and meaning shall be interpreted as follows:

AA	Aluminum Association
AAMA	Architectural Aluminum Manufacturers Association
AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
AFBMA	Anti-Friction Bearing Manufacturers Association
AGA	American Gas Association
AGMA	American Gear Manufacturers Association
AIS	American Iron and Steel
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AITC	American Institute of Timber Construction
AMCA	Air Moving and Conditioning Association
ANSI	American National Standards Institute
APA	American Plywood Association
API	American Petroleum Institute
AREA	American Railway Engineering Association
ASAE	American Society of Agricultural Engineers
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.
ASME	American Society of Mechanical Engineers
ASTM	American Society of Testing and Materials
AWI	Architectural Woodwork Institute
AWPA	American Wood Preservers' Association
AWPB	American Wood Preservers Bureau
AWS	American Welding Society
AWWA	American Water Works Association
BHMA	Builders' Hardware Manufacturers Association
CBMA	Certified Ballast Manufacturers Association
CDA	Copper Development Association
CISPI	Cast Iron Soil Pipe Institute
CMAA	Crane Manufacturers Association of America
CRSI	Concrete Reinforcing Steel Institute
Fed. Spec.	Federal Specifications
HI	Hydraulic Institute
HMI	Hoist Manufacturers Institute
ICBO	International Conference of Building Officials
IEEE	Institute of Electrical and Electronics Engineers, Inc.
IPCEA	Insulated Power Cable Engineer's Association
MMA	Monorail Manufacturers Association

NACE	National Association of Coatings Engineers
NBMA	National Builders Hardware Association
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association
NESC	National Electric Safety Code
NFPA	National Fire Protection Association
NLMA	National Lumber Manufacturers Association
NWMA	National Woodwork Manufacturers Association
OECI	Overhead Electrical Crane Institute
OSHA	Occupational Safety and Health Act (both Federal & State)
PS	Product Standards Sections - U.S. Department of Commerce
RMA	Rubber Manufacturers Association
SAE	Society of Automotive Engineers
SSPC	Society for Protective Coatings
TCA	Tile Council of America
TEMA	Tubular Exchanger Manufacturers Association
UBC	Uniform Building Code
UL	Underwriter's Laboratories, Inc.
WWPA	Western Wood Products Association

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01450

FIELD QUALITY CONTROL

PART 1 GENERAL

1.01 SCOPE OF WORK

A. This Section defines the responsibilities of the Owner to adequately test materials and products used for the construction of site, concrete, and masonry improvements.

1.02 MATERIALS COMPLIANCE WITH AIS

A. P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), includes an “American Iron and Steel (AIS)” requirement in section 436 that requires Clean Water State Revolving Loan Fund (CWSRF) and Drinking Water State Revolving Loan Fund (DWSRF) assistance recipients to use iron and steel products that are produced in the United States for projects for the construction, alteration, maintenance, or repair of a public water system or treatment works. This Project meets the definition of such work, and the Environment Protection Agency (EPA) implementation requirements for this AIS requirement are outlined within the DWSRF memorandum titled “Implementation of American Iron and Steel provisions of P.L. 113-76, Consolidated Appropriations Act, 2014” included as part of the RLF Supplemental General Conditions.

B. All parties are required to comply with these requirements and to ensure that all qualifying iron and steel products used in this project must be produced in the United States. See RLF Supplemental General Conditions for additional details.

1.03 RELATED SECTIONS

A. Section 01300 – Submittals

B. Section 01400 – Quality Requirements

C. Division 2 – Site Work

D. Division 3 – Concrete

E. Division 4 – Masonry

1.04 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM), latest edition:

1. ASTM C1077 Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation

2. ASTM C1093 Standard Practice for Accreditation of Testing Agencies for Masonry

3. ASTM D3740 Standard Practice for Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction

4. ASTM E329 Standard Specification for Agencies Engaged in Construction Inspection and/or Testing

5. ASTM E543 Standard Specification for Agencies Performing Nondestructive Testing

1.05 SUBMITTALS

A. See Section 01300, Submittals, for submittal procedures.

B. Submit copies of all testing results, both passing and failing, to the Engineer.

C. Submit the name and qualifications of the testing laboratory for approval prior to the commencement of work. All materials testing, whether in a laboratory or in the field, shall be conducted by a testing agency approved by the Owner.

1.06 QUALITY ASSURANCE

A. The Owner will employ the services of an independent testing agency to conduct Quality Control testing on the installation of construction materials at the work site, including those delivered to the site from off-site sources, to prove compliance with the Specifications. Construction materials include, but are not limited to, select material, clay, topsoil, sand, rock, crushed stone, asphalt, concrete, mortar, and grout.

B. Prior to delivery to the Project site, the Contractor shall provide initial manufacturer or supplier certifications for approval by the Engineer of all off-site materials at no additional cost to the Owner. The Contractor shall coordinate with the Engineer for any additional sampling and testing of off-site materials when requested by the Owner.

C. Any materials that fail Quality Control testing shall be reworked or replaced and then retested by the Contractor at no additional cost to the Owner. The Contractor shall submit copies of all retesting results to the Engineer.

D. The Owner will conduct testing in accordance with the frequencies indicated in Division 02 (site improvements), Division 03 (concrete) and Division 04 (masonry). Any additional testing required by the Contractor to assure that the Work is done in accordance with the plans and specifications, and beyond those indicated frequencies, shall be the responsibility of the Contractor at no additional cost to the Owner.

1.07 QUALIFICATIONS

A. Employment of testing agencies by the Owner in no way relieves the Contractor of the obligation to perform Work in accordance with requirements of Contract Documents.

B. Contractor Employed Agency:

1. Testing agency: Comply with requirements of ASTM C1077, ASTM C1093, ASTM D3740, ASTM E329, and ASTM E543.

2. Laboratory: Authorized to operate in state in which Project is located.

3. Testing Equipment: Calibrated at reasonable intervals with devices of accuracy traceable to either National Bureau of Standards or accepted values of natural physical constants.

PART 2 PRODUCTS

2.01 TEST RESULTS

A. Each sample or test shall be accompanied by the following written data, and reported to the Engineer with the test results:

1. Name of project and identifying project number
2. Name of Contractor
3. Project street address
4. Appropriate test name
5. Date of sampling or testing
6. Name of technician collecting samples
7. Sample number (if more than one sample per day)
8. Name of technician performing the testing
9. Location of the sample
10. Storage method of untested samples, e.g., soil corings, concrete cylinders, etc.

B. Provide a minimum of three (3) copies of all test results with the following distribution: the Engineer, the Engineer's field representative, and the Contractor. Additional copies shall be provided to the Owner as requested.

PART 3 EXECUTION

3.01 SAMPLING AND TESTING

A. Sampling of materials and frequency of testing shall be as specified in each Section.

B. The sampling of materials shall be conducted in the presence of the Engineer.

C. The witnessing of any testing shall be at the discretion of the Engineer.

END OF SECTION

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SECTION 01480

WATERTIGHTNESS TEST FOR HYDRAULIC STRUCTURES

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials and incidentals required and perform water tightness testing of water-containing structures as listed herein and all retesting until the structures meet the requirements as specified herein for the following:

1. Grit Chambers
2. BNR Basins
3. Secondary Clarifier Distribution Structure – 3 Way Splitter Box
4. Secondary Clarifiers No. 1 and No. 3
5. Tertiary Filters, UV, and Post Aeration Structure
6. RAS Pump Station No. 2
7. Lift Station No. 3 and No. 4 Wet Wells
8. Effluent Pump Station Wet Well

1.02 MATERIALS COMPLIANCE WITH AIS

A. P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), includes an “American Iron and Steel (AIS)” requirement in section 436 that requires Clean Water State Revolving Loan Fund (CWSRF) and Drinking Water State Revolving Loan Fund (DWSRF) assistance recipients to use iron and steel products that are produced in the United States for projects for the construction, alteration, maintenance, or repair of a public water system or treatment works. This Project meets the definition of such work, and the Environment Protection Agency (EPA) implementation requirements for this AIS requirement are outlined within the DWSRF memorandum titled “Implementation of American Iron and Steel provisions of P.L. 113-76, Consolidated Appropriations Act, 2014” included as part of the RLF Supplemental General Conditions.

B. All parties are required to comply with these requirements and to ensure that all qualifying iron and steel products used in this project must be produced in the United States. See RLF Supplemental General Conditions for additional details.

1.03 SUBMITTALS

A. Submit the results of each watertightness test of each structure to the Engineer for review. The submittal format shall be similar to that shown in Figure A attached to the end of this Section.

1.04 REFERENCE STANDARDS

A. American Concrete Institute (ACI), latest edition.

1. ACI 350.1R Testing Reinforced Concrete Structures for Watertightness

1.05 PROJECT/SITE REQUIREMENTS

A. Coordinate timing and procedures for obtaining testing water and structure testing with the Engineer and Owner well in advance of the actual testing.

B. Water Source and Disposal

1. Water for testing shall be provided by the Owner

2. Water shall be potable water. All labor, equipment and materials shall be supplied by the Contractor, including suitable and approved means to prevent back-siphoning of water into the municipal water system.

3. Test water shall be disposed of by the Contractor in a manner approved by the Owner and the Arkansas Division of Environmental Quality (DEQ). Contractor is responsible for any pumping, piping, and appurtenances to convey the test water to the point of disposal designated by the Owner.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 GENERAL

A. The testing of reinforced concrete tanks or water containment structures shall conform to the following standards and as modified herein.

1. Reinforced concrete water retaining structures – ACI 350.1R (or as appropriate) and as specified herein

B. Perform watertightness tests prior to placing backfill around structures in order to permit observation and detection of leakage points. Walls may be backfilled prior to testing only when approved in writing by the Engineer. The request to backfill prior to testing shall include a description of the method proposed to detect leakage points after the backfill is in place. Approval to place backfill prior to testing shall not relieve the Contractor of the responsibility for conducting watertightness tests.

3.02 EXAMINATION

A. Inspect the structure to be tested for potential leakage paths such as cracks, voids, etc. and repair such paths in compliance with the provisions of these Specifications or as approved by the Engineer.

3.03 PREPARATION

A. Thoroughly clean the structure of dirt, mud, and construction debris prior to initiating watertightness tests. The floor and sumps shall be flushed with water to provide a clean surface, ready for testing.

B. Inlet and outlet pipes not required to be operational for the tests may be temporarily sealed or bulkheaded prior to testing.

C. Confirm adequacy of seals around gates and valves and reset or seal as approved by the Engineer. Estimates of gate or valve leakage will not be allowed as adjustments to the measured tank or structure leakage.

3.04 TESTING PROCEDURES

A. Conditions of Testing

1. Do not begin initial filling of concrete structures until all concrete elements of the structure have attained the designed compressive strength of the concrete, nor less than 14 days after all concrete walls or base slabs have been placed.

2. Initial filling of reinforced concrete structures shall not exceed a rate of 4 feet in 24 hours.

3. Fill unlined concrete structures to the maximum operating water surface level and maintain the water at that level for at least 72 hours prior to beginning watertightness tests to minimize water absorption by the concrete during testing. The testing of fully lined concrete structures may be started as soon as the structure is filled.

B. Testing Procedures

1. Duration of the test shall not be less than that required for a drop in the water surface of 2 inches based on the calculated maximum allowable leakage rate nor three (3) days.

2. Loss of volume measurements shall be taken at 24-hour intervals. The loss of volume is usually determined by measuring the drop in water surface elevation and computing the change in volume of the contained water. Measure water surface elevation at not less than two (2) locations at 180 degrees apart and preferably at four (4) locations 90 degrees apart. Record water temperature 18 inches below the water surface when taking the first and last sets of measurements.

C. Reports

1. Submit to the Engineer watertightness test results for each structure tested on the form shown in Figure A or a form with a similar format.

2. Notify the Engineer of the scheduling of tests three (3) working days prior to the tests. The Engineer may monitor any watertightness testing performed on the structures.

3.05 ACCEPTANCE

A. The following conditions shall be considered as NOT meeting the criteria for acceptance regardless of the actual loss of water volume from the structure.

1. Ground water leakage into the structure through floors, walls, or wall-floor joints

2. Structures which exhibit flowing water from joints, cracks or from beneath the foundation (except for underdrain systems)

B. The watertightness of concrete tanks and structures shall be considered acceptable when loss of water volume is within the criteria listed below.

1. For unlined tanks with a side-water depth of 25 feet or less, loss of volume not exceeding 0.1 percent in 24 hours

3.06 REPAIRS AND RETESTING

A. Structures failing the watertightness test and not exhibiting visible leakage may be retested after an additional stabilization period of seven (7) days. Tanks failing this test shall be repaired prior to further testing.

B. Repair structures that fail the watertightness test and structures showing visible leakage in compliance with the provisions of these Specifications or as approved by the Engineer.

C. Repairs and retesting of tanks shall be accomplished at no additional cost to the Owner.

END OF SECTION

FIGURE A

WATERTIGHTNESS TEST REPORT

PROJECT Bentonville WRRF Improvements SUBMITTED BY _____

STRUCTURE* _____ TEST DATES _____

Allowable loss of water volume _____ percent in 24 hours

Measured loss of water volume _____ percent in 24 hours

TEST READINGS

Water temperature at start _____°F Water temperature at end _____°F

Humidity _____% Ambient Air Temp _____°F Wind Direction _____ Rainfall _____ in. Evaporation _____in.

	Date	Time	Location 1	Location 2	Location 3	Location 4	Initials
1.							
2.							
3.							
4.							
5.							

Change in level _____

Average change in level _____

Correction for precipitation/evaporation _____

Corrected change in level = CL = _____

$$\frac{(CL) \times (\text{surface area}) \times (100)}{(\text{initial water volume}) \times (\text{number of test days})} = \text{measured percent water loss in 24 hrs.}$$

Notes and field observations**

_____

_____

_____

*Attach a sketch showing a plan of the structure and measurement locations.
**Place date and initials at the beginning of each entry.

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SECTION 01500

TEMPORARY FACILITIES

PART 1 GENERAL

1.01 TEMPORARY OFFICES

A. Temporary offices shall be established on the job site where approved or directed by the Engineer, adequately furnished, and maintained in a clean, orderly condition by the Contractor. The Contractor or an authorized representative shall be present in the field office at all times while work is in progress. Instructions received there from the Engineer shall be considered as delivered to the Contractor.

B. Contractor shall provide a separate building of at least 300 sq-ft of floor space for the exclusive use of the Engineer throughout the period of construction. The temporary office shall be weathertight, have a tight floor at least 8 inches off the ground and shall be insulated all around with rigid insulation board not less than 1/2-in thick and suitably ventilated. The office shall have at least three screened windows capable of being opened, a screen door and a solid door provided with cylinder lock and three keys. The lock shall have a separate key from the Contractor’s facilities. The office shall be provided with janitor service (at least once a week), sewage disposal, heating and air conditioning equipment, electrical wiring, outlets, and fixtures suitable to light the tables and desk adequately as directed. Provide separate toilet facilities for the exclusive use of the Engineer.

C. Provide the following furniture and equipment in the Engineer's office:

1. One (1) plan table, 3-ft by 5-ft and one (1) stool
2. Desk about 3-ft by 5-ft with desk chair
3. Three (3) additional chairs
4. Plan rack, as directed
5. Shelves, as directed
6. Three (3) four-drawer, filing cabinet with lock, (legal sized)
7. Coat rack and hooks
8. Desk calculator with paper
9. Air Conditioner (12,000 BTU/minimum)
10. One (1) conference table (6-ft)
11. Eight (8) folding chairs
12. First aid kit suitable for 25 people, USA Blue Book No. 330735, or equal
13. All paper products for use with the office equipment and sanitary facilities
14. Trash can and trash bags

D. Supply all fuel for heating and pay all electrical bills.

E. The Contractor shall modify the existing Vehicle Storage Building to provide a temporary facility to house the existing Lab operations while modifications are being made to the existing facility. The temporary facility shall have sufficient space to conduct required testing operations, sufficient countertop space for testing equipment and operations, and all required safety features for a laboratory facility. The space shall be provided with sufficient outlets to operate required equipment and plumbed for water, DI water, and sewer.

1.02 MATERIALS COMPLIANCE WITH AIS

A. P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), includes an “American Iron and Steel (AIS)” requirement in section 436 that requires Clean Water State Revolving Loan Fund (CWSRF) and Drinking Water State Revolving Loan Fund (DWSRF) assistance recipients to use iron and steel products that are produced in the United States for projects for the construction, alteration, maintenance, or repair of a public water system or treatment works. This Project meets the definition of such work, and the Environment Protection Agency (EPA) implementation requirements for this AIS requirement are outlined within the DWSRF memorandum titled “Implementation of American Iron and Steel provisions of P.L. 113-76, Consolidated Appropriations Act, 2014” included as part of the RLF Supplemental General Conditions.

B. All parties are required to comply with these requirements and to ensure that all qualifying iron and steel products used in this project must be produced in the United States. See RLF Supplemental General Conditions for additional details.

1.03 TEMPORARY INTERNET SERVICE

A. Install an internet service connection in the Engineer's field office. Pay all bills charged against the service, including installation charge and all monthly charges throughout the construction period. The internet service will be provided with a means to connect to a wired router using Cat 5e or Cat 6 cabling.

B. The internet service shall have download speeds of at least 50 Mbits/s and upload speeds of at least 10 Mbits/s.

C. Provide a laser color printer, plain paper copier and scanner device. The Contractor shall provide all maintenance and expendable supplies, including paper and ink, for the device. The device shall be Xerox WorkCentre® C7000DN or equal.

D. Pay all costs for installation, maintenance, and removal of the high-speed internet service. The monthly cost including data overage charges, shall be paid for by the Contractor for the duration of the project.

1.04 TEMPORARY LIGHT AND POWER

A. Furnish temporary light and power, including 220 Volt service for welding, complete with wiring, lamps and similar equipment as required to adequately light all work areas and with sufficient power capacity to meet the reasonable needs of all subcontractors. Make all necessary arrangements with the local electric company for temporary electric service and pay all expenses in connection therewith.

B. Provide properly configured NEMA polarized outlets to prevent insertion of 110-120 Volt plugs into higher voltage outlets. For connection of power tools and equipment, provide outlets equipped with ground-fault circuit interrupters, reset button and pilot light.

C. Provide grounded extension cords. Use "hard-service" cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords if more than one length is required.

D. Provide general service incandescent lamps as required for adequate illumination. Provide guard cages or tempered glass enclosures when exposed to breakage. Provide exterior fixtures were exposed to moisture.

1.05 TEMPORARY HEAT

A. Provide all heat as may be necessary for thawing out and heating the ground or materials and for proper execution, protection and drying out the of work.

1.06 TEMPORARY AIR AND WATER

A. The Contractor shall provide all air and steam, including piping and appurtenances required for testing pipelines, structures, and equipment.

B. Water for testing purposes shall be provided by the Owner. All labor, equipment, and piping to connect to Owner-designated water sources shall be provided by Contractor.

C. Remove temporary piping and appurtenances on completion of testing.

1.07 TEMPORARY SANITARY FACILITIES

A. Provide self-contained, single-occupant toilet units of the chemical or aerated recirculation, properly vented, and fully enclosed in a fiberglass or other approved non-absorbent shell.

B. Contractor’s personnel and guests shall not have access to Owner’s restrooms.

1.08 FIRE EXTINGUISHERS

A. Provide portable UL-rated, Class A fire extinguishers for temporary offices and similar spaces. In other locations, provide portable UL-rated Class ABC dry chemical extinguishers or a combination of NFPA recommended Classes for the exposure. Comply with NFPA 10 and 241 for classification, extinguishing agent and size required by location and class of fire exposure.

1.09 LAYOUT OF TEMPORARY FACILITIES

A. Before starting the work, the Contractor shall submit to the Engineer his requirements for space for temporary structures and storage of materials. Where onsite space for temporary facilities is limited, the allocation of the available space will be made by the Engineer. Should the Contractor require space in addition to that allocated, the Contractor shall make his own arrangements for storage of materials and equipment in

locations off the construction site. For the allocated space, the Contractor shall submit to the Engineer for approval, his proposed plan and layout for all temporary offices, sanitary facilities, temporary construction roads, storage buildings, storage yards, temporary water service and distribution, temporary power service and distribution, and temporary telephone service.

1.10 STORAGE BUILDINGS

A. The Contractor shall erect, or provide as approved, temporary storage buildings of the various sizes as required for the protection of mechanical and electrical equipment and materials as recommended by manufacturers of such equipment and materials. The buildings shall be provided with such environmental control systems that meet recommendations of manufacturers of all equipment and materials stored in the buildings. The buildings shall be of sufficient size and so arranged or partitioned to provide security for their contents and provide ready access for inspection and inventory. At or near the completion of the work, and as directed by the Engineer, the temporary storage buildings shall be dismantled, removed from the site, and remain the property of the Contractor.

B. Combustible materials (paints, solvents, fuels, etc.) shall be stored in a well-ventilated building removed from other buildings.

1.11 STORAGE YARDS

A. The Contractor shall construct temporary storage yards for the storage of materials that are not subject to damage by weather conditions. Materials such as pipe and reinforcing and structural steel shall be stored on pallets or racks, off the ground, and in a manner that allows ready access for inspection and inventory. Temporary gravel surfacing of the storage yards shall meet with the approval of the Engineer.

1.12 CONTRACTOR’S WORK AREA

A. The Contractor shall limit his operations and storage of equipment and materials to the areas designated and as directed by the Engineer.

B. Contractor shall erect a suitable fence around each tree or group of trees shown as “protected” or “to be saved” on the plans. Any such trees damaged shall be repaired or replaced, as directed by the Engineer, at the Contractor’s expense.

C. Except as provided herein, no sidewalk, private property, or other area adjacent to the plant site shall be used for storage of the Contractor's equipment and materials unless prior written approval is obtained from the legal owner.

D. The Contractor shall maintain the area during construction in a manner that will not obstruct operations on street areas. The Contractor shall proceed with his work in an orderly manner, maintaining the construction site free of debris and unnecessary equipment or materials.

E. At all times, maintain areas covered by the Contract and public properties free from accumulations of waste, debris, and rubbish caused by construction operations.

F. Excavated materials shall be removed from the site in a manner that will cause the least damage to adjacent lawns, grassed areas, trees, gardens, shrubbery, or fences regardless of whether these are on private property or on public rights-of-way.

G. Cleaning and disposal operations shall comply with local ordinances and antipollution laws. Do not burn or bury rubbish and waste materials on the project site. Do not dispose of volatile wastes such as mineral spirits, oil, chemicals, or paint thinner in storm or sanitary drains. Do not dispose of wastes into streams or waterways.

H. Wet down dry materials and rubbish to allay dust and prevent blowing dust.

I. Provide approved containers for collection and disposal of waste materials, debris, and rubbish and arrange for appropriate periodic emptying of the containers.

J. The Contractor shall furnish, install, and maintain temporary heat and enclosures to provide adequate working areas for personnel. The Contractor shall furnish temporary heating units that have been tested and labeled by UL, FM or other recognized association related to the type of fuel being used and maintain reasonable temperatures within the temporary enclosures.

1.13 TEMPORARY ACCESS ROADS AND PARKING SPACE

A. The Contractor shall construct temporary construction access roads and detours as are required to execute the work. The roads shall meet with the approval of the Engineer and be maintained in good condition until no longer needed; at which time the temporary roads shall be removed, and the area left in a condition satisfactory to the Engineer.

B. The Contractor shall construct temporary parking facilities for his employees, his Sub-Contractor's employees, other employees, and the Engineer.

1.14 PROTECTION OF THE FINISHED CONSTRUCTION

A. The Contractor shall assume the responsibility for the protection of all finished construction and shall repair and restore any and all damage to finished work to its original or better state.

B. Where responsibility can be determined, the cost for replacement or repair of damaged work shall be charged to the party responsible. If responsibility cannot be fixed, the cost shall be borne by the Contractor.

C. Wheeling of any loads over finished floors, either with or without plank protection, shall not be permitted in anything except rubber-tired wheelbarrows, buggies, trucks, or dollies. This applies to all finished floors and to all exposed concrete floors as well as those covered with composition tile or other applied surfacing and shall apply to all trades.

D. Where structural concrete is also the finished surface, care shall be taken to avoid marking or damaging those surfaces.

1.15 REMOVAL OF TEMPORARY FACILITIES AND UTILITIES

A. At such time or times any temporary construction facilities and utilities are no longer required for the work, the Contractor shall notify the Engineer of his intent and schedule for removal of the temporary facilities and utilities and obtain the Engineer's approval before removing the same. As approved, the Contractor shall disconnect and/or dismantle the temporary facilities and utilities and remove them from the site as his property. Leave the site in such condition as specified, as directed by the Engineer, and/or as shown on the Plans.

B. In unfinished areas, the condition of the site shall be left in a condition that will restore original drainage, evenly graded, seeded, or planted as necessary, and left with an appearance equal to, or better than original.

1.16 PAYMENT

A. The work specified in this Section shall be considered incidental and payment will be included as part of the appropriate lump sum or unit prices stated in the Proposal.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01562

DUST CONTROL

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, equipment, and means required and carry out effective measures wherever and as often as necessary to prevent construction activities from producing dust in amounts damaging to property, cultivated vegetation, animals, or causing a nuisance to persons living in or occupying buildings in the vicinity.

B. The Contractor shall be responsible for any damage resulting from any dust originating from its operations. The dust abatement measures shall be continued until dust is no longer produced and the Contractor is relieved of further responsibility by the Engineer.

C. Dust control shall generally be accomplished by the use of water.

D. Methods of controlling dust shall meet all air pollutant standards as set forth by Federal and State regulatory agencies.

1.02 MATERIALS COMPLIANCE WITH AIS

A. P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), includes an “American Iron and Steel (AIS)” requirement in section 436 that requires Clean Water State Revolving Loan Fund (CWSRF) and Drinking Water State Revolving Loan Fund (DWSRF) assistance recipients to use iron and steel products that are produced in the United States for projects for the construction, alteration, maintenance, or repair of a public water system or treatment works. This Project meets the definition of such work, and the Environment Protection Agency (EPA) implementation requirements for this AIS requirement are outlined within the DWSRF memorandum titled “Implementation of American Iron and Steel provisions of P.L. 113-76, Consolidated Appropriations Act, 2014” included as part of the RLF Supplemental General Conditions.

B. All parties are required to comply with these requirements and to ensure that all qualifying iron and steel products used in this project must be produced in the United States. See RLF Supplemental General Conditions for additional details.

1.03 RELATED SECTIONS

A. Section 01350 – Environmental Protection Procedures

B. Section 02100 – Site Preparation

C. Section 02200 – Earthwork

D. Section 02370 – Erosion and Sedimentation Control

E. Section 02501 – Pavement and Drainage Improvements

1.04 REFERENCE STANDARDS

A. American Association of state Highway and Transportation Officials (AASHTO), latest edition:

1. AASHTO M144 – Standard Specification for Calcium Chloride

1.05 SUBMITTALS

A. See Section 01300, Submittals, for submittal procedures.

B. All sources of water for dust control must be tested and approved. Submit copies of all testing results to the Engineer.

C. Submit the name and qualifications of the testing laboratory for approval prior to the commencement of work.

PART 2 PRODUCTS

2.01 DUST SUPPRESSION ADDITIVES

A. Calcium chloride shall conform to AASHTO M144, Type I except the requirements for "total alkali chlorides" and other impurities shall not apply.

2.02 WATER

A. The Contractor is responsible for obtaining water for dust suppression from a suitable water source, approved by the Engineer. The Contractor shall not use potable water from the public water system without prior permission from the Public Utility.

PART 3 EXECUTION

3.01 DUST CONTROL

A. Execute work by methods to minimize raising dust from construction activities. All available precautions shall be taken to control dust. When the Engineer judges dust to be a problem, the Contractor shall control dust by sprinkling, by applying calcium chloride, or by other means as directed.

B. If track drills are used for drilling rock, water must be provided with the drill to eliminate the dust.

3.02 ENVIRONMENTAL PROTECTION

A. Do not apply dust suppression additives or other substances in watercourses.

3.03 MEASUREMENT AND PAYMENT

A. The work included in this Section shall be considered incidental to the Contract, and no separate payment will be made for the various items including the furnishing of all materials, equipment, tools, labor, and incidentals required for dust control. No additional compensation will be allowed for any costs incurred due to delays caused by necessary dust control operations.

END OF SECTION

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SECTION 01600

MATERIALS, TRANSPORTATION AND HANDLING

PART 1 GENERAL

1.01 SCOPE OF WORK

A. This Section specifies the general requirements for the approval, delivery, handling, storage, and protection for all items required in the construction of the work. Specific requirements, if any, are specified with the related item.

1.02 MATERIALS COMPLIANCE WITH AIS

A. P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), includes an “American Iron and Steel (AIS)” requirement in section 436 that requires Clean Water State Revolving Loan Fund (CWSRF) and Drinking Water State Revolving Loan Fund (DWSRF) assistance recipients to use iron and steel products that are produced in the United States for projects for the construction, alteration, maintenance, or repair of a public water system or treatment works. This Project meets the definition of such work, and the Environment Protection Agency (EPA) implementation requirements for this AIS requirement are outlined within the DWSRF memorandum titled “Implementation of American Iron and Steel provisions of P.L. 113-76, Consolidated Appropriations Act, 2014” included as part of the RLF Supplemental General Conditions.

B. All parties are required to comply with these requirements and to ensure that all qualifying iron and steel products used in this project must be produced in the United States. See RLF Supplemental General Conditions for additional details.

1.03 APPROVAL OF MATERIALS

A. Unless otherwise specified, only new materials and equipment shall be incorporated in the work. All materials and equipment furnished shall be subject to the inspection and approval of the Engineer. No material shall be delivered to the work without prior approval of the Engineer.

B. Submit, in accordance with Section 01300, Submittals, data relating to materials and equipment proposed to be furnished for the work. Such data shall be in sufficient detail to enable the Engineer to identify the particular product and to form an opinion as to its conformity to the specifications.

C. Facilities and labor for handling and inspection of all materials and equipment shall be furnished by the Contractor. If the Engineer requires, either prior to beginning or during the progress of the work, submit additional samples or materials for such special tests as may be necessary to demonstrate that they conform to the requirements specified herein. Such samples shall be furnished, stored, packed, and shipped as directed at the Contractor's expense. Except as otherwise noted, the Owner will arrange for and pay for the tests.

D. Any delay of approval resulting from the Contractor's failure to submit samples or data promptly shall not be used as a basis of a claim against the Owner or the Engineer.

E. In order to demonstrate the proficiency of workmen or to facilitate the choice among several textures, types, finishes, and surfaces, provide such samples of workmanship or finish as may be required.

F. The materials and equipment used on the work shall correspond to the approved samples or other data.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 TRANSPORTATION AND DELIVERY

A. Transport and handle items in accordance with manufacturer's instructions.

B. Schedule delivery to reduce long term on-site storage prior to installation and/or operation. Under no circumstances shall equipment be delivered to the site more than one (1) month prior to installation without written authorization from the Engineer.

C. Coordinate delivery with installation to ensure minimum holding time for items that are hazardous, flammable, easily damaged or sensitive to deterioration.

D. Deliver products to the site in manufacturer's original sealed containers or other packing systems, complete with instructions for handling, storing, unpacking, protecting, and installing.

E. All items delivered to the site shall be unloaded and placed in a manner which will not hamper the Contractor's normal construction operation or those of subcontractors and other contractors and will not interfere with the flow of necessary traffic.

F. Provide necessary equipment and personnel to unload all items delivered to the site.

G. Promptly inspect shipment to assure that products comply with requirements, quantities are correct, and items are undamaged. For items furnished by others (i.e., Owner, other Contractors), perform inspection in the presence of the Engineer. Notify Engineer verbally, and in writing, of any problems.

3.02 STORAGE AND PROTECTION

A. Store and protect products in accordance with the manufacturer's instructions, with seals and labels intact and legible. Storage instruction shall be studied by the Contractor and reviewed with the Engineer. Instruction shall be carefully followed and a written record of this kept by the Contractor. Arrange storage to permit access for inspection.

B. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.

C. Cement and lime shall be stored under a roof and off the ground and shall be kept completely dry at all times. All structural, miscellaneous, and reinforcing steel shall be stored off the ground or otherwise to prevent accumulations of dirt or grease and in a position to prevent accumulations of standing water and to minimize rusting. Beams shall be stored with the webs vertical. Precast concrete shall be handled and stored in a manner to prevent accumulations of dirt, standing water, staining, chipping, or cracking. Brick, block, and similar masonry products shall be handled and stored in a manner to reduce breakage, cracking and spalling to a minimum.

D. All mechanical and electrical equipment and instruments subject to corrosive damage by the atmosphere if stored outdoors (even though covered by canvas) shall be stored in a weathertight building to prevent injury. The building may be a temporary structure on the site or elsewhere, but it must be satisfactory to the Engineer. Building shall be provided with adequate ventilation to prevent condensation. Maintain temperature and humidity within range required by manufacturer.

1. All equipment shall be stored fully lubricated with oil, grease and other lubricants unless otherwise instructed by the manufacturer.

2. Moving parts shall be rotated a minimum of once weekly to ensure proper lubrication and to avoid metal-to-metal "welding". Upon installation of the equipment, the Contractor shall start the equipment, at least half load, once weekly for an adequate period of time to ensure that the equipment does not deteriorate from lack of use.

3. Lubricants shall be changed upon completion of installation and as frequently as required thereafter during the period between installation and acceptance. New lubricants shall be put into the equipment at the time of acceptance.

4. Prior to acceptance of the equipment, the Contractor shall have the manufacturer inspect the equipment and certify that its condition has not been detrimentally affected by the long storage period. Such certifications by the manufacturer shall be deemed to mean that the equipment is judged by the manufacturer to be in a condition equal to that of equipment that has been shipped, installed, tested and accepted in a minimum time period. As such, the manufacturer will guarantee the equipment equally in both instances. If such a certification is not given, the equipment shall be judged to be defective. It shall be removed and replaced at the Contractor's expense.

END OF SECTION

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SECTION 01611

METEOROLOGICAL AND SEISMIC DESIGN CRITERIA

PART 1 GENERAL

1.01 SCOPE

A. Buildings, non-structural components, and non-building structures shall be designed in accordance with this section. In the event of conflict with requirements in other sections, the more stringent criteria shall be followed.

1.02 DESIGN CRITERIA

A. Buildings, non-structural components, non-building structures including anchorage of such items, shall be designed in accordance with the following criteria:

1. General Design Data		
	Building code and references	IBC 2015, ASCE 7-10 "Minimum Design Loads for Buildings and Other Structures", AISC 360 "Specification for Structural Steel Buildings", AISC 341 "Seismic Provisions for Structural Steel Buildings"
	Site elevation, above mean sea level (ft)	
	Design flood elevation (ft)	
	Design groundwater elevation (ft)	
2. Wind Design Data		
	Ultimate design wind speed, V_{ult} (mph)	
	Nominal design wind speed, V_{asd} (mph)	
	10 year mean recurrence internal (MRI) serviceability wind speed (mph)	
	Exposure category	
	Risk Category	
	Building enclosure classification	Partially Enclosed
3. Snow Design Data		
	Ground snow load, P_g (psf)	
	Importance factor (snow loads), I	
	Exposure factor (C_e)	
	Thermal factor (C_t)	
4. Ice Design Data		
	Nominal ice thickness, t (in)	
	Concurrent wind speed, V_c (mph)	
	Importance factor (ice loads – ice thickness), I_i	
	Importance factor (ice loads – concurrent wind), I_w	

5. Seismic Design Data		
	Mapped MCE short period spectral response acceleration, S_S	
	Mapped MCE one second period spectral response acceleration, S_1	
	Design short period spectral response acceleration, S_{DS}	
	Design one second period spectral response acceleration, S_{D1}	
	Risk Category	
	XXX Building Importance factor, I	
	XXX Building Seismic Design Category	
	YYY Building Importance factor, I	
	YYY Building Seismic Design Category	
	ZZZ Building Importance factor, I	
	ZZZ Building Seismic Design Category	
	Non-Structural Components Importance Factor, I_P	As indicated in the Non-Structural Components Schedule
	Non-Structural Components Seismic Design Category	
	Non-Building Structures Importance Factors, I	As indicated in the Non-Building Structure Schedule or in the applicable reference documents, whichever is greater.

1.03 WIND ANCHORAGE

A. Equipment that is to be located outdoors shall have anchor bolts designed for the effects of wind forces, as determined in accordance with ASCE 7, Chapters 26-31.

B. Design of anchorage shall be in accordance with the Anchorage in Concrete and Masonry section.

1.04 SEISMIC DESIGN

A. General

1. Structural systems shall provide continuous load paths, with adequate strength and stiffness to transfer all seismic forces from the point of application to the point of final resistance.

B. Pre-Engineered Buildings

1. Pre-engineered buildings shall have sufficient strength and ductility to resist the specified seismic effects defined for buildings and shall meet all of the design, proportioning, detailing, inspection, and quality assurance provisions of the specified building code.

2. "W" for buildings shall include the total dead load, the total operating weight of permanent equipment and the effective contents of vessels, and applicable portions of other loads, as required by the specified building code.

C. Non-Structural Components

1. Non-structural components are architectural, mechanical, and electrical items that are permanently attached to and supported by a structure but are not part of the structural system, as indicated in Chapter 13 of ASCE 7. The Non-Structural Components Schedule identifies the components that require seismic design. The requirements of this paragraph are applicable only to the items listed in the Non-Structural Components Schedule.
2. General

    a. Design of non-structural components shall be in accordance with all applicable provisions of ASCE 7, Chapter 13.

    b. "W_p" shall include the total operating weight of the component or system, including, but not limited to, any insulation, fluids, and concentrated loads such as valves, condensate traps, and similar components.

3. Anchorage Design

    a. Every component in the Non-Structural Components Schedule shall have its anchorage to the supporting structure designed in accordance with ASCE 7, Chapter 13.

    b. Design of anchorage shall be in accordance with the Anchorage in Concrete and Masonry section.

    c. Components shall be attached so that seismic forces are transferred to the structural system. Curbs that support roof-mounted equipment shall be designed to transfer forces from the equipment into the main structural roof members. All structural attachments shall be bolted, welded, or otherwise positively fastened. Frictional resistance due to gravity shall not be considered in evaluating the required resistance to seismic forces.

4. Component Design

    a. Every component in the Non-Structural Components Schedule shall be designed for seismic conditions in accordance with ASCE 7, Chapter 13.

    b. Components shall have sufficient strength and ductility to resist the specified seismic effects, and shall meet all of the design, proportioning, detailing, inspection, and quality assurance provisions of the specified building code and other referenced codes. Components shall be designed to be operable during and following a design level seismic event without collapsing, breaking away from supports, creating an ignition hazard, or releasing any contents.

    c. Seismic effects that shall be analyzed in the design of piping systems include the dynamic effects of the piping system, contents, and supports. The interaction

between piping systems and the supporting structures, including other mechanical and electrical equipment, shall also be considered. Where pipe supports are to be designed by Contractor, as required by the Pipe Supports section, both the piping and support systems shall be designed to meet the applicable requirements of ASCE 7, Chapter 13.

5. Submerged Components

   a. Components that are to be submerged in water shall be designed to withstand loads from the effects of water sloshing during the seismic event.

   b. The calculation of the sloshing effects shall be in accordance with the latest edition of ACI 350.3.

6. Seismic Certification

   a. Design of components and their anchorage shall be certified by one of the following methods.

      1) Analysis and design by a design professional registered in the state of the project.

      2) Shake table testing based upon a nationally recognized testing standard procedure, such as ICC-ES AC 156, acceptable to the authority having jurisdiction.

      3) Experience data, based upon nationally recognized procedures acceptable to the authority having jurisdiction.

   b. Components indicated in the Non-Structural Components Schedule to require special seismic certification shall be certified only by methods 2 or 3 above, except that certification for containment of hazardous materials may be by any of the three methods.

7. Construction Documents

   a. Construction documents (fabrication or shop drawings) of non-structural components shall be sealed by a design professional that is registered in the state of the project.

   b. Documents shall be sealed whether the basis for certification is analysis and design, shake table testing, or experience data.

   c. The sealing method shall clearly indicate that the component and its anchorage have been designed for the code required seismic forces.

8. Submittals

   a. The construction documents, structural design calculations, shake table certification, and experience data certification, as applicable, shall be submitted in accordance with the Submittal Procedures section.

D. Non-Building Structures

1. Non-building structures are the items described as such in Chapter 15 of ASCE 7. The Non-Building Structures Schedule identifies the items that require seismic design.

2. The requirements of this paragraph are applicable only to the items listed in the Non-Builiding Structures Schedule.

3. General

   a. Design of non-building structures shall be in accordance with all applicable provisions of ASCE 7, Chapter 15.

   b. Design of anchorage shall be in accordance with the Anchorage in Concrete and Masonry section.

   c. "W" shall include the total dead load and shall also include all normal operating contents of tanks, vessels, bins, and piping.

   d. Non-building structures shall provide sufficient strength and ductility to resist the specified seismic effects, and shall meet all of the design, proportioning, detailing, inspection, and quality assurance provisions of the specified building code and other referenced codes.

   e. The seismic design of non-building structures shall provide sufficient stiffness, strength and ductility to resist the effects of seismic ground motions during the design level earthquake.

   f. Non-building structures shall be designed to be operable during and following a design level seismic event, without collapsing, breaking away from supports, creating an ignition hazard, or releasing any contents.

4. Construction Documents

   a. Construction documents (fabrication or shop drawings) depicting all seismic force resisting elements of non-building structures shall be sealed by a design professional that is registered in the state of the project.

5. Submittals

   a. The construction documents shall be submitted in accordance with the Submittal Procedures section.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

Component	Applicable Specification Section	Importance Factor (I_p)	Special Seismic Certification Required
Stone Copings	04 00 00		
Metal Partition Walls			
Wood Stud Partition Walls			
Filter Washwater Troughs	06 82 00	1.0	
Weir Plates and Scum Baffles	06 82 00	1.0	
Basin Launder Covers	06 82 00	1.0	
Odor Control Covers	06 82 00	1.0	
Steel Doors and Frames	08 11 14		
Floor Access Doors and Hatches	08 31 19		
Overhead Coiling Steel and Fire Doors	08 33 23.23		
Overhead Coiling Aluminum Doors	08 33 23.33		
Aluminum Entrances and Assemblies	08 41 14		
Steel Windows	08 51 23		
Aluminum Windows	08 51 13		
Glass Glazing	08 81 00		
Acoustical Panel Ceilings	09 51 13		
Metal Toilet Compartments	10 21 13.13		
Plastic Laminate-Clad Toilet Compartments	10 21 13.16		
Plastic Toilet Compartments	10 21 13.19		
Louvers and Vents	08 90 00		
Metal Lockers	10 51 13		
Horizontal Split Case Centrifugal Pumps	43 21 13.11	1.0	
Horizontal End Suction Centrifugal Pumps	43 21 13.13	1.0	
Vertical End Suction Centrifugal Pumps	43 21 13.41	1.0	
Vertical Diffusion Vane Pumps	43 21 46.11	1.0	
Submersible Pumps	43 21 39.11	1.0	
Horizontal Submersible Propeller Pumps	43 21 39.23	1.0	
Progressing Cavity Pumps	43 21 36.11	1.0	
Hydraulically Actuated Reciprocating Piston Pumps	43 21 33.13	1.0	
PART 4 Vertical Column Sump and Sewage Pumps	43 21 33.13	1.0	PART 5
PART 6 Submersible Sump and Sewage Pumps	22 13 29.17	1.0	PART 7
7.01 Traveling Water Screens	46 21 51	1.0	7.02
Disk Cloth Filters	46 61 41	1.0	
Mechanically Cleaned Bar Screens	46 21 12	1.0	
Vortex Grit Removal Equipment	46 22 23	1.0	
Grit Separation and Classification Equipment	46 22 64	1.0	
7.03 Pump Mixing Equipment	46 41 22	1.0	7.04
7.05 Sludge Heat Exchangers	46 73 46	1.0	7.06
Gas Control and Safety Equipment	43 13 46	1.0	
Packaged Odor Control System	44 31 19	1.0	
Packed Tower Scrubbers	44 31 12	1.0	
PART 8 Carbon Adsorption Units	44 31 17	1.0	PART 9
Biotrickling Filter System	44 31 32	1.0	PART 10
Odor Control Fans	43 11 21	1.0	
Tilting Weirs	46 51 73	1.0	
Circular Clarifying Equipment	46 43 21	1.0	

Component	Applicable Specification Section	Importance Factor (I_p)	Special Seismic Certification Required
Solids Contact Clarifier Equipment	46 43 53	1.0	
Secondary Wastewater Treatment Clarifying Equipment	46 43 23	1.0	
Chain-and-Flight Clarifier Equipment	46 43 11	1.0	
PART 11 Inclined Plate Settlers	46 43 76	1.0	PART 12
Rapid Mixers and Carbon Slurry Mixers	46 41 11	1.0	
Submersible Mixers	46 41 23	1.0	
Vertical Mixer	46 41 24	1.0	
Vertical Turbine Flocculation Equipment	46 41 34	1.0	
Surface Aeration Equipment	46 51 11	1.0	
Floating Mechanical Aerators	46 51 13	1.0	
Fine Pore Diffused Aeration Equipment	46 51 31	1.0	
Coarse Bubble Diffusers	46 51 21	1.0	
12.01 Multistage Centrifugal Blowers	43 11 16	1.0	12.02
Compressed Air Equipment – Base Mounted Compressors	43 12 32	1.0	
Rotary Screw Air Compressors	43 12 24	1.0	
Gas Chemical Feed Systems	46 31 00	1.5	x
Engine Generators	26 32 13	1.5	x
Emergency Gas Treatment Systems	46 31 26	1.5	x
Laboratory Furniture	12 56 53		
Low Pressure Reverse Osmosis/Nano Filtration Equipment	46 63 25	1.0	
Cartridge Filters	46 61 53	1.0	
Fiberglass Reinforced Plastic Chemical Storage Tanks	43 41 45.13	1.5	x
Polyethylene Chemical Storage Tanks	43 41 43.13	1.5	x
Steel Chemical Storage Tanks	43 41 16	1.5	x
Ammonia Storage Tanks	43 42 22	1.5	x
Aboveground Fuel Storage Tanks	33 56 13	1.5	x
Filter Underdrains and Media	46 61 12	1.0	
Panels, Consoles, and Appurtenances	40 67 00	1.0	
Fire Sprinkler Systems	21 13 00	1.5	
Clean Agent Fire Suppression Systems	21 22 00	1.5	
12.03 Hydraulic Freight Elevator	14 24 13		12.04
12.05 Hydraulic Passenger Elevator	14 24 23		12.06
12.07 Screw Conveyors	41 12 13.36	1.0	12.08
12.09 Belt Conveyors	41 12 13.19	1.0	12.010
Traveling Bridge Cranes	41 22 13.13	1.0	
Gantry Cranes	41 22 13.17	1.0	
Jib Cranes	41 22 13.19	1.0	
Piping Systems and Related Pipe Supports	40 05 07.13		
Enter systems here.		1.0	
Enter systems here.		1.0	
Plumbing	22 00 00	1.0	
Water Heaters	22 00 00	1.0	

Component	Applicable Specification Section	Importance Factor (I_p)	Special Seismic Certification Required
HVAC Equipment	23 00 00	1.0	
Gas Vent Systems	23 00 00	1.0	
Air-Side HVAC Air Handling Units, Furnaces, Makeup Air Units, Fans, Heaters, and Other Mechanical Components Constructed of Sheet Metal Framing	23 00 00	1.0	
Ductwork Including Inline Components	23 00 00	1.0	
Hydronic Specialties	23 21 11	1.0	
Wet-Side HVAC Air Separators, Chemical Feed Pots, Expansion Tanks, Pumps, and Other Mechanical Components Constructed of High-Deformability Materials	23 21 11	1.0	
Piping, Tubing, and Inline Components	23 21 11	1.0	
Heating Systems Equipment	23 50 13	1.0	
Gas Vent Systems	23 50 13	1.0	
Heaters, and Other Mechanical Components Constructed of Sheet Metal Framing	23 50 13	1.0	
Wet-Side HVAC Boilers and Other Mechanical Components Constructed of High-Deformability Materials	23 50 13	1.0	
Refrigeration Systems	23 70 00	1.0	
Condensing Units, Heat Pumps, Packaged Air Conditioning Units and Heat Pumps and Other Mechanical Components Constructed of Sheet Metal Framing	23 70 00	1.0	
Wet-Side HVAC Chillers and Other Mechanical Components Constructed of High-Deformability Materials	23 70 00	1.0	
Dehumidification Systems	23 84 21	1.0	
Air Distribution Systems	23 30 13	1.0	
Air-Side HVAC Air Handling Units, Furnaces, Makeup Air Units, Fans, Air Distribution Boxes, and Other Mechanical Components Constructed of Sheet Metal Framing	23 30 13	1.0	
Ductwork Including Inline Components	23 30 13	1.0	
Lighting Fixtures	26 05 11	1.0	
Lighting Panels	26 05 11	1.0	
Power Panels	26 05 11	1.0	
Surge Protection Device	26 05 11	1.0	
Separately Enclosed Motor Starters	26 05 11	1.0	
Separately Enclosed Manual Starters	26 05 11	1.0	
Control Stations	26 05 11	1.0	
Separately Enclosed Circuit Breakers	26 05 11	1.0	
Disconnect Switches	26 05 11	1.0	
Lighting and Auxiliary Power Transformers	26 05 11	1.0	
Power Centers	26 05 11	1.0	

Component	Applicable Specification Section	Importance Factor (I_p)	Special Seismic Certification Required
Power Factor Correction Capacitors	26 05 11	1.0	
Lighting Contactors	26 05 11	1.0	
Photoelectric Controls	26 05 11	1.0	
Relay Enclosures	26 05 11	1.0	
Alarm Horn and Beacon	26 05 11	1.0	
Adjustable Frequency Drives	26 29 24	1.0	
Medium Voltage Adjustable Frequency Drives	26 19 24	1.0	
Common Motor Requirements for Process Equipment	40 05 93	1.0	
Secondary Integral Unit Substations	26 11 16	1.0	
Primary Integral Unit Substations	26 11 13	1.0	
Medium Voltage, Three Phase, Pad Mounted Transformers	26 12 19	1.0	
Medium Voltage Metal Clad Switchgear		1.0	
Low Voltage Switchgear	26 23 00	1.0	
Metal Enclosed Load Interrupter Switchgear	26 13 16	1.0	
Medium Voltage Motor Control Equipment	26 19 39	1.0	
Switchboards	26 24 13	1.0	
600 Volt Class Motor Control Centers	26 24 23	1.0	
Bypass Isolation Automatic Transfer Switch	26 36 26	1.0	
Lightning Protection Systems	26 41 13	1.0	
Fire Detection and Alarm Systems	28 31 16	1.5	
Fire Detection and Signaling System	28 31 19	1.5	

Note: Some specification sections listed in the Non-Structural Components Schedule cover multiple items. Within those sections, some components may be exempt from seismic design based on their weight and/or their height above the floor. Reference ASCE 7, Paragraph 13.1.4 for specific conditions of the exemptions. Some ductwork and piping systems may also be exempt from seismic design based on criteria in their respective paragraphs in ASCE 7, Chapter 13.

Non-Building Structures Schedule			
Structure	Applicable Specification Section	Applicable Specification Section	Importance Factor (I)
Steel Water Storage Reservoir	13205	33 16 13.13	
Wrapped Prestressed Concrete Reservoir	13207	33 16 23	
Elevated Steel Water Storage Tanks	13210	33 16 19	
Aluminum Dome Basin Covers	13225	13 34 26	
Radial Beam Fixed Digester Covers/ Dual Deck Truss Type Fixed Digester Covers	13232	46 73 11	
Dual Deck Truss Type Floating Digester Covers/ Dual Deck truss type Gas-Holding Digester Covers	13234	46 73 16	
Membrane Gas-Holding Digester Covers	13250	46 73 71	

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SECTION 01665

TRENCH SAFETY REQUIREMENTS

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, and equipment and perform all operations to plan, design, construct, install, maintain, monitor, modify as necessary, and remove upon completion, a Trench Safety System as specified herein.

B. The requirements of this Section apply to all trenches or excavations that equal or exceed a depth of five feet, measured from the ground surface at the highest side of the trench or excavation to the excavated bottom.

1.02 MATERIALS COMPLIANCE WITH AIS

A. P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), includes an “American Iron and Steel (AIS)” requirement in section 436 that requires Clean Water State Revolving Loan Fund (CWSRF) and Drinking Water State Revolving Loan Fund (DWSRF) assistance recipients to use iron and steel products that are produced in the United States for projects for the construction, alteration, maintenance, or repair of a public water system or treatment works. This Project meets the definition of such work, and the Environment Protection Agency (EPA) implementation requirements for this AIS requirement are outlined within the DWSRF memorandum titled “Implementation of American Iron and Steel provisions of P.L. 113-76, Consolidated Appropriations Act, 2014” included as part of the RLF Supplemental General Conditions.

B. All parties are required to comply with these requirements and to ensure that all qualifying iron and steel products used in this project must be produced in the United States. See RLF Supplemental General Conditions for additional details.

1.03 RELATED SECTIONS

A. Section 02315 – Excavation, Trenching and Backfilling

B. Section 02316 – Structural Excavation, Backfilling and Grading

1.04 REFERENCE STANDARDS

A. U.S. Occupational Safety and Health Administration (OSHA) Standards, 29 CFR 1926, Subpart P – Excavations, latest revision at time of construction Agreement execution, as required by Arkansas Code Annotated § 22-9-212.

1. In accordance with Arkansas Code Annotated § 22-9-212, the OSHA Standards for excavation and trenching, as noted above, are incorporated into the project specifications by reference.

2. Following award of the contract, the Contractor shall provide names and contact information for all subcontractors who will conduct trenching and/or excavation work on the Project. The Owner will prepare and submit a *Contract For Excavation Reporting Form* (https://www.labor.arkansas.gov/divisions/occupational-safety-and-health/aosh-arkansas-occup-safety-and-health/aosh-reporting/excavation-and-trenching) to the Arkansas Department of Labor, and a copy of the submitted form will be provided to the Contractor.

PART 2 PRODUCTS

2.01 GENERAL

A. All materials and products incorporated into the Trench Safety System shall be suitable for their intended uses; shall meet all design criteria and parameters used by the Trench Safety System designer; and shall meet all applicable requirements of OSHA Standards.

PART 3 EXECUTION

3.01 PROCEDURES

A. Prepare a Trench Safety System Plan for review and acknowledgement by the Engineer. The Engineer's review is for information purposes only, and receipt of the Plan does not relieve the Contractor or any subcontractor of preparing, implementing, and conforming all efforts to the requirements of the referenced federal regulations and state law.

1. The Trench Safety System Plan shall describe the Trench Safety System techniques proposed to be used on the project.

2. Specific references to the applicable OSHA Standards sections shall be included for each technique to be used.

B. The Trench Safety System Plan shall be in writing, site specific and sufficiently detailed and clear to be understandable and usable by all personnel who will be executing, supervising, and witnessing the excavation and trenching operations. A copy of the Trench Safety System Plan shall be available at the site of excavation and trenching operations at all times.

C. If borings and/or detailed geotechnical analyses are required to develop the Trench Safety System Plan, they shall be executed by the Contractor at no additional cost to the Owner.

D. For trenches having depths greater than the various limits given in the OSHA Standards (8, 12 or 20 feet, depending on the techniques used), a site-specific protective system shall be designed by a Registered Professional Engineer in the State where the project is located, who is experienced in soil mechanics and structural design. The design shall be signed, sealed, and dated by the Professional Engineer, and it shall identify those specific locations where the design is applicable.

3.02 METHODS OF PROVIDING FOR TRENCH SAFETY

A. Protective systems referenced in this Section shall be as defined and described in 29 CFR 1962.652, "Requirements for Protective Systems".

B. It is the duty, responsibility, and prerogative of the Contractor to determine the specific applicability of a proposed Trench Safety System for each field condition encountered on the project. Contractor specifically holds the Owner, Engineer, and any of their designated representatives harmless in any actions resulting from the failure or inadequacy of the Trench Safety System used to complete the project.

C. Unless otherwise noted on the drawings or excluded below, Sloping/Benching, Trench Shielding with trench boxes, and/or Sheeting/Shoring/Bracing protective systems may be used on this project.

D. Restrictions on the use of the various protective systems for this project are as follows:

1. Sloping or Benching: Subject to site conditions
2. Trench Shields/Boxes: No restrictions
3. Sheeting/Shoring/Bracing: No restrictions

3.03 INSPECTION DUTIES OF CONTRACTOR

A. Provide a Competent Person, as defined in the OSHA Standards, to make frequent inspections of the trenching operations and the Trench Safety System in full conformance with the OSHA Standards.

B. If evidence of a possible cave-in or landslide is apparent, all work in the trench shall immediately cease and not be resumed until all necessary precautions have been taken to safeguard personnel entering the trench.

C. In an emergency situation that may threaten or affect the safety or welfare of any persons or properties, the Contractor shall act at his discretion to prevent possible damage, injury, or loss. Any additional compensation or time extension claimed for such actions shall be considered in view of the cause of the emergency and in accordance with the Agreement.

3.04 MEASUREMENT AND PAYMENT

A. Trench Safety Requirements shall be paid for in accordance with Arkansas Code Annotated 22-9-212, with the pay item as listed in the Bid Form.

END OF SECTION

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SECTION 01666

TESTING OF PIPELINES

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, tools, equipment, and related items required to perform exfiltration testing and deflection testing of gravity pipelines and to perform pressure and leakage testing of pressure pipelines.

1.02 MATERIALS COMPLIANCE WITH AIS

A. P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), includes an “American Iron and Steel (AIS)” requirement in section 436 that requires Clean Water State Revolving Loan Fund (CWSRF) and Drinking Water State Revolving Loan Fund (DWSRF) assistance recipients to use iron and steel products that are produced in the United States for projects for the construction, alteration, maintenance, or repair of a public water system or treatment works. This Project meets the definition of such work, and the Environment Protection Agency (EPA) implementation requirements for this AIS requirement are outlined within the DWSRF memorandum titled “Implementation of American Iron and Steel provisions of P.L. 113-76, Consolidated Appropriations Act, 2014” included as part of the RLF Supplemental General Conditions.

B. All parties are required to comply with these requirements and to ensure that all qualifying iron and steel products used in this project must be produced in the United States. See RLF Supplemental General Conditions for additional details.

1.03 RELATED SECTIONS

A. Section 01310 – Control of Work

B. Section 02510 – Water Distribution

1.04 REFERENCE STANDARDS

A. American Society of Testing Materials (ASTM), latest edition:

1. ASTM F1417 Standard Practice for Installation Acceptance of Plastic Non-pressure Sewer Lines Using Low-Pressure Air

B. American Water Works Association (AWWA), latest edition:

1. AWWA C600 Installation of Ductile Iron Water Mains and Their Appurtenances

2. AWWA C605 Underground Installation of Polyvinyl Chloride (PVC) and Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe and Fittings

PART 2 PRODUCTS

2.01 WATER FOR CONSTRUCTION PURPOSES

A. Where potable water is required in large quantity for pipeline testing, it will be provided by the Owner. For temporary installations, the Owner will install a flow meter at a fire hydrant on site for the Contractor's use. The Contractor shall be responsible for paying a meter deposit and constructing and maintaining a heated enclosure for the meter. In the event that the Owner installs a water main tap and permanent meter connection, the Contractor shall be responsible for constructing all temporary and permanent water main extensions, and all work shall be approved by the Owner.

B. The Contractor shall furnish all labor and equipment, including test pump with regulated bypass meters and gauges, required for conducting pipeline tests. Furnish temporary piping and valves as required to transport water used in testing from source to test location.

PART 3 EXECUTION

3.01 GENERAL

A. Field-test the entire length of installed gravity and pressure lines for water tightness.

B. Conduct hydrostatic pressure and leakage tests on all pressure pipelines carrying water or wastewater (sanitary sewage).

C. Schedule time and sequence of testing, subject to observation and approval by the Owner and the Engineer. Provide adequate labor, tools, and equipment for the test.

D. Coordinate all valve operation with the Owner. Water valves on the Utility's existing distribution system may only be operated by Utility personnel.

E. Locate and repair any leaks discovered during the initial filling of the pipeline or during the course of the tests at no additional cost to the Owner.

3.02 CLEANING

A. At the conclusion of the work, thoroughly clean all pipelines by flushing with water or other means to remove all dirt, stones, pieces of wood, or other material that may have entered the pipes during the construction period. Remove debris cleaned from the lines from the low end of the pipeline. Remove all temporary pipeline plugs or other obstructions after cleaning and/or testing. After the pipelines are cleaned and if the groundwater level is above the pipe or following a heavy rain, the Engineer will examine the pipes for leaks. Repair any defective pipes or joints.

3.03 TEST PROCEDURES FOR GRAVITY PIPELINES

A. Gravity Pipelines, General: After laying pipe and consolidating backfill, test pipe using Low-Pressure Air Testing and the Allowable Deflection Test.

B. Low-Pressure Air Testing of Gravity Sewers

1. Perform low-pressure air testing in accordance with ASTM F1417. For safety reasons, limit air testing to pipe sections 24-inch diameter and smaller (average inside diameter). Sewers larger than 24-inch diameter may be air tested at each joint with the Engineer's approval.

2. Refer to the Bentonville Standard Specifications Section 17.4 Gravity Sewer Air Testing Time Requirements for minimum specified time required for a 1.0 PSIG pressure drop and 0.5 PSIG pressure drop for all size and length of pipes for Q = 0.0015, or compute the minimum time allowed for the pressure to drop from 3.5 psig to 2.5 psig by the following equation:

$$T = \frac{0.085 * D * K}{Q}$$

Where: T = time for pressure to drop 1.0 psi gauge, in seconds
K = 0.000419 * D * L, but not less than 1.0
D = average inside diameter, in inches
L = length of line of same pipe size being tested, in feet
Q = rate of loss, assume 0.0015 ft^3/minute/square feet internal surface

3. Repair all observed leaks regardless of the air test results.

4. All gravity sewer lines shall be tested in accordance with the following procedures after all trenching and boring in area of sewer mains and sewer services:

   a. Plug all pipe outlets with suitable test plugs. Brace each plug securely.

   b. Pipe air supply to the pipeline to be tested in such a manner that the air supply may be shut off, pressure observed, and air pressure released from the pipe without workmen entering the manhole.

   c. Add air slowly to the portion of pipe under test until the internal pressure of the line is raised to approximately 4 psig but less than 5 psig.

   d. Shut the air supply off and allow at least 2 minutes for the air pressure to stabilize.

   e. When the pressure has been bled down to 3 1/2 psig and stabilized, start the test.

   f. If the pipe section does not decrease from 3.5 psi to 2.5 psi in less time than is allotted the section passes the test.

C. Mandrel Testing

1. The mandrel (go/no-go) device shall be cylindrical in shape and constructed with either 9 or 16 evenly spaced arms or prongs. Mandrels with fewer arms will be rejected as not sufficiently accurate. The contact length of the mandrel's arms shall equal or exceed the nominal ID of the sewer to be inspected. Critical mandrel dimensions shall carry a tolerance of + 0.01". The mandrel and all necessary equipment for the mandrel test shall be provided by the Contractor. No handmade mandrel devices shall be used for testing unless prior permission is given by the Owner and Engineer.

2. The mandrel shall be hand-pulled by the Contractor through all flexible pipe sewer lines no earlier than 30 days after the trench has been completely backfilled. Any sections of the sewer not passing the mandrel shall be uncovered and the Contractor shall re-bed, re-round or replace the sewer to the satisfaction of the Owner and Engineer. Any repaired section shall be re-tested.

3. The OD of the mandrel shall be set according to the following table:

Nominal Size	Pipe	Diameter (In) Mandrel size (In) at 5% deflection
6"	SDR 35	5.46"
6"	SDR 26	5.33"
8"	SDR 35	7.28"
8"	SDR 26	7.11"
10"	SDR 35	9.08"
10"	SDR 26	8.87"
12"	SDR 35	10.79"
12"	SDR 26	10.55"
15"	SDR 35	13.20"
15"	SDR 26	12.90"
18"	SDR 35	16.13"
18"	SDR 26	15.76"
21"	SDR 35	19.00"
21"	SDR 26	18.57"
24"	SDR 35	21.36"
24"	SDR 26	20.87"
27"	SDR 35	24.06"
27"	SDR 26	23.51"
30"	SDR 35	26.29"
30"	SDR 26	25.68"

D. Close Circuit Television Inspection – (CCTV)

1. All sewer mains that are installed will require a Close Circuit Television Inspection (CCTV). The inspection will be performed by City personnel after all other required sewer main line testing has been completed. The inspection consists of hydro-jet cleaning the sewer main line and allowing it to drain for a period of not less than one hour. After the sewer main line has been allowed to drain the CCTV inspection will begin. Defects that will be documented are pipe bell ends facing downstream, narrow or rough manhole inverts, misaligned or backward service wyes, loose or missing pipe joint gaskets, pipe joints not fully seated, crushed, or out-of-round pipe and the pooling of water in the pipe and at service wyes, joints and manhole inverts. The camera has been fitted with a measuring device that can determine the depth of the water in the event of any pooling. Any pooling of water that is deeper than 3/4" will require the sewer main line to be adjusted to eliminate the problem. The only personnel allowed in the CCTV vehicle during the inspection are City of Bentonville employees.

2. A pass or fail decision is not made in the field. The camera inspection is recorded on video recording software and then reviewed by the Owner. After review of the recording, the comments will be made available to the Engineer indicating approval of the sanitary sewer mains or a list of defects that require repair.

3. All CCTV inspections or re-inspections that are necessary are to be requested in written form by email to the Owner by the Engineer. The Engineer shall provide accurate record drawing of sewer system, with profiles, at time of CCTV request.

4. One attempt will be made by the Owner to adequately clean new sewer mains for proper CCTV inspection. If during construction sufficient care is not taken to keep rocks, dirt or debris from entering new sewer mains and extra cleaning is necessary, CCTV staff will not complete the inspection. The Owner will then advise the Engineer of the condition of the pipe. The Contractor shall be responsible for the additional cleaning needs. It will be the Engineer's responsibility to communicate to the Contractor why the inspection was stopped and why they are now responsible for cleaning and removing obstructions in the sewer main. After the Contractor has completed the necessary cleanings, the Engineer will contact the Owner and request continuation of the CCTV inspection.

5. After the completion of the required repairs by the Contractor, a re-inspection must be performed using the same procedures as for the initial inspection. All re-inspections will at the expense of the Contractor.

6. Full CCTV inspection shall be completed, and first tracer wire inspection shall be completed before final inspection.

3.04 TEST PROCEDURES FOR PRESSURE PIPELINES

A. GENERAL

1. After laying pipe and consolidating backfill, subject all newly laid pipe or any isolated section thereof, to hydrostatic pressure testing. Conduct the pressure testing for the duration as described below, unless otherwise specified or noted on the Drawings.

Disconnect all meters, fixtures, devices, or appliances which are connected to the pipeline system, and which might be damaged if subjected to the specified test pressure. Plug or cap the ends of branch lines during the testing procedures.

2. Fill each isolated (capped or plugged) section of pipe slowly with water and expel all entrapped air. If permanent air vents are not located at all high points, install corporation or blow-off cocks at such points to expel air as filling takes place. After expelling all air, close the cocks and keep the pipe filled until tested. Examine all exposed pipe, fittings, valves, hydrants, and joints while under test pressure, and repair all visible leaks. Remove and replace any cracked or defective pipe, fittings, valves, or hydrants discovered during testing. Replace the damaged pipe or appurtenances and repeat the testing to the satisfaction of the Engineer.

B. Do not conduct hydrostatic pressure testing until at least five (5) days have elapsed after installation of concrete thrust blocking. Do not conduct testing until at least two (2) days have elapse for concrete blocking containing high-early-strength cement.

C. Hydrostatic Leakage Tests

1. Testing allowance shall be defined as the quantity of water that must be supplied into the newly laid pipe, or any isolated section thereof, to maintain the specified leakage test pressure after the air in the pipeline has been expelled and the pipe has been filled with water.

2. Determine quantity of makeup water required to maintain the hydrostatic test pressue by recording the quantity of water pumped into the pipeline through a standard water meter of a size appropriate to secure an accuracy of ±2% at the average flow rate pumped. The Engineer must approve other methods of measuring the quantity of water pumped prior to commencing the hydrostatic test.

3. Test pressure shall not be less than 1.25 times (125%) the stated sustained working pressure of the pipeline measured at the highest elevation along the test section and not less than 1.5 times (150%) the stated sustained working pressure at the lowest elevation of the test section. In all cases, the test pressure shall never less than the minimum test pressures listed in Table 1 below. Maintain the test pressure for a period of two (2) hours. The test pressure shall not vary by more than 5 psi (+/-) for the duration of the test.

Table 2
Minimum Pressure Test Requirements

Piping Description	**Test Pressure**
Pumped Process Piping	50 psi
Plant Water Piping	125 psi
Potable Water Piping	150 psi

4. Conduct hydrostatic testing of ductile iron piping in accordance with AWWA C600 and testing of PVC piping in accordance with AWWA C605 and AWWA M23. Testing allowance shall be defined as the maximum quantity of water that is added into the pipeline in order to return it to the original test pressure No PVC or ductile iron pipeline test section will be accepted if the quantity of makeup water is greater than that determined by the following formula:

$$Q = \frac{L * D * \sqrt{P}}{148{,}000}$$

Where: Q = the allowable leakage, in gallons per hour
L = the length of pipeline tested, in feet
D = the nominal diameter of the pipe, in inches
P = the average test pressure during the leakage tests, in psi gauge

5. In the event any section of the tested line fails to meet the specified requirements for water tightness, repair the cause of the excessive leakage and retest the section of line at no additional cost to the Owner.

3.05 FINAL ACCEPTANCE

A. The Owner will not accept pipe installation as completed until the Contractor has repaired all known leaks, whether or not leakage is within allowable limits. Locate and repair all leaks at no additional cost to the Owner.

B. The Engineer will certify successful completion of all required tests before the pipeline is accepted by the Owner.

3.06 WATER SOURCE

A. Unless otherwise noted in the plans, notify the Owner 24 hours prior to obtaining water for testing purposes.

END OF SECTION

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SECTION 01731

CUTTING, CORING AND PATCHING

PART 1 GENERAL

1.01 SCOPE OF WORK

A. This Section covers the cutting, coring, rough and finished patching of holes and openings. Holes and opening may be in existing construction, or in parts of new construction. Procedures for cutting and patching will be the same for either condition.

B. All cutting, coring, and rough patching shall be performed by the Contractor or Prime Contractor requiring the opening. Finish patching shall be the responsibility of the Contractor or Prime Contractor requiring the opening and shall be performed by the trade associated with the application of the particular finish.

C. Provide all cutting, fitting, and patching, including attendant excavation and backfill, required to complete the work or to:

1. Make its several parts fit together properly

2. Uncover portions of the work to provide for installation of ill-timed or improperly scheduled work

3. Remove and replace defective work

4. Remove and replace work not conforming to requirements of Contract Documents

5. Remove samples of installed work as specified for testing

6. Provide penetrations of structural surfaces and materials for installation of piping, ductwork, equipment, and electrical conduit

7. Provide penetrations of non-structural surfaces and materials for installation of piping, ductwork, equipment, and electrical conduit. The determination of what is a nonstructural surface or material shall be made by the Engineer

8. Remove, install, or relocate materials or equipment

1.02 MATERIALS COMPLIANCE WITH AIS

A. P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), includes an “American Iron and Steel (AIS)” requirement in section 436 that requires Clean Water State Revolving Loan Fund (CWSRF) and Drinking Water State Revolving Loan Fund (DWSRF) assistance recipients to use iron and steel products that are produced in the United States for projects for the construction, alteration, maintenance, or repair of a public water system or treatment works. This Project meets the definition of such work, and the Environment Protection Agency (EPA) implementation requirements for this AIS requirement are outlined within the DWSRF memorandum titled “Implementation of

American Iron and Steel provisions of P.L. 113-76, Consolidated Appropriations Act, 2014" included as part of the RLF Supplemental General Conditions.

B. All parties are required to comply with these requirements and to ensure that all qualifying iron and steel products used in this project must be produced in the United States. See RLF Supplemental General Conditions for additional details.

1.03 RELATED SECTIONS

A. Section 01110 – Summary of Work

B. Section 01300 - Submittals

C. Section 01732 – Pipe Penetrations

D. Section 02140 – Dewatering and Drainage

E. Division 3 – Concrete

F. Division 4 – Masonry

1.04 SUBMITTALS

A. Submit, in accordance with Section 01300, Submittals, a written request prior to executing any cutting or alteration that is not shown or detailed on the contract documents that affects or requires:

1. Cutting structural members

2. Holes drilled in beams or other structural members

3. Work of the Owner or any separate contractor

4. Structural value or integrity of any element of the project

5. Integrity or effectiveness of weather-exposed or moisture-resistant elements or systems

6. Efficiency, operational life, maintenance, or safety of operational elements

7. Visual qualities of sight-exposed elements

B. Request shall include:

1. Identification of the project

2. Description of affected work

3. The reason for cutting, alteration, or excavation

4. Effect on work of Owner or any separate contractor, or on structural or weatherproof integrity of project

5. Description of proposed work

    a. Method and extent of cutting, patching, alteration, or excavation
    b. Trades who will execute the work
    c. Products proposed to be used
    d. Extent of refinishing to be done

6. Alternatives to cutting and patching

7. If the work is considered out of scope, provide a cost proposal

8. Confirmation of coordination with any separate contractor whose work will be affected

9. Related shutdown requests if required to do the work

10. Request for hot work permit if required to do the work

C. Submit written notice to the Engineer designating the date and the time that the work will be uncovered.

D. When a written request is required, do not proceed with the work until a written notice to proceed is received from the Engineer.

PART 2 PRODUCTS

2.01 MATERIALS

A. Comply with specifications and standards for each specific product involved. Where there is no equivalent specification, the Contractor shall notify the Engineer who will provide a specification for the materials to be used.

B. Concrete and grout for rough patching shall be as specified in Divisions 3 and 4.

C. Materials for finish patching shall be equal to those of adjacent construction. Where existing materials are no longer available, use materials with equivalent properties and that will provide the same appearance. The materials are to be approved by the Engineer prior to their use.

PART 3 EXECUTION

3.01 INSPECTION

A. Inspect existing conditions of project, including elements subject to damage or to movement during cutting and patching.

B. After uncovering work, inspect conditions affecting installation of products, or performance of work.

C. Report unsatisfactory or questionable conditions to the Engineer in writing; do not proceed with work until the Engineer has provided further instructions.

3.02 PREPARATION

A. Provide adequate temporary support as necessary to assure structural value or integrity of affected portion of work.

B. Protect surrounding materials and equipment prior to starting work.

C. Contain and control cooling liquids and slurry produced by the cutting and coring operations.

D. When the cutting or coring will result in the structure or equipment being exposed to provide adequate weather protection.

E. Provide dewatering for excavation work in accordance with Section 02140, Dewatering and Drainage.

3.03 PERFORMANCE

A. Execute cutting and demolition by methods that will prevent damage to other work and will provide proper surfaces to receive installation of repairs.

B. Execute excavating and backfilling by methods that will prevent settlement or damage to other work. When excavating in close proximity to piping, duct banks or other items subject to damage, use hand excavation.

C. All equipment and workplace safety shall conform to OSHA standards and specifications pertaining to plugs, noise, and fume pollution, wiring and maintenance.

D. Where possible, employ original installer or fabricator to perform cutting and patching for:

1. Weather-exposed or moisture-resistant elements
2. Sight-exposed finished surfaces

E. Execute fitting and adjustment of products to provide a finished installation to comply with specified products, functions, tolerances, and finishes.

F. Restore work that has been cut or removed; install new products to provide completed work in accordance with requirements of Contract Documents.

G. Refinish entire surfaces as necessary to provide an even finish to match adjacent finishes:

1. For continuous surfaces, refinish to nearest intersection
2. For an assembly, refinish entire unit

H. Remove rubble and excess patching materials from the premises.

3.04 CORING

A. All coring shall be performed in such a manner as to limit the extent of patching. Locate the rebar before coring to minimize cut throughs.

B. Coring shall be performed with an approved non-impact rotary tool with diamond core drills.

C. Size of holes shall be suitable for pipe, conduit, sleeves, equipment, or mechanical seals to be installed.

D. Fit work to minimize space to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

E. Fit to pipes and other penetrations in tanks to be watertight using seals or other methods defined in the specifications.

F. All holes cut through concrete and masonry walls, slabs or arches shall be core drilled unless otherwise approved. All work shall be performed by mechanics skilled in this type of work.

G. If holes are cored through floor slabs, they shall be drilled from below where possible. If holes are drilled from above, provide protection and containment below the area being drilled to catch the plug and contain liquid and slurry.

3.05 CUTTING

A. All cutting shall be performed in such a manner as to limit the extent of patching.

B. Fit work to minimize space to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

C. Cutting shall be performed with a concrete saw and diamond saw blades of proper size.

D. Provide for control of slurry generated by sawing operation on both sides of wall and from below if cutting a floor.

E. When cutting a reinforced concrete wall or floor, the cutting shall be done so as not to damage the bond between the concrete and reinforcing steel left in structure. Cut shall be made so that steel neither protrudes nor is recessed from the face of the cut.

F. Adequate bracing of area to be cut shall be installed prior to start of cutting. Check area during sawing operations for partial cracking and provide additional bracing as required to prevent a partial release of cut area during sawing operations.

G. Provide equipment of adequate size to remove cut panel.

H. Saw cut concrete and masonry prior to breaking out sections.

I. Install work at such time as to require the minimum amount of cutting and patching.

J. All cutting of structural members shall be done in a manner directed by the Engineer.

K. Cut opening only large enough to allow easy installation of the equipment, ducting, piping, or conduit.

L. When existing conduits or pipe sleeves are cut off at the floor line or wall line, they shall be filled with grout or suitable patching material.

3.06 PROTECTION

A. Provide devices and methods to protect other portions of project from damage.

B. Provide protection from elements for that portion of the project that may be exposed by cutting and patching work.

C. Maintain excavations free from water.

3.07 PATCHING

A. Rough patching shall be such as to bring the cut or cored area flush with existing construction unless otherwise shown.

B. Finish patching shall match existing surfaces as approved.

C. Patching shall be of the same kind and quality of material as was removed.

D. The completed patching work shall restore the surface to its original appearance or better.

E. Patching of waterproofed surfaces shall render the area of the patching completely waterproofed to include the joint between the existing material and the patch.

F. Equipment damaged during cutting and patching shall be replaced or repaired by the equipment manufacturer, at the Engineer's sole discretion and at the expense of the Contractor doing the work.

G. Repaint any damage to factory applied paint finishes using touch-up paint furnished by the equipment manufacturer. The entire damaged panel or section shall be repainted in accordance with the field painting requirements specified in Division 9 at the expense of the Contractor doing the work.

H. Slurry or tailings resulting from coring or cutting operations shall be contained and vacuumed or otherwise removed from the area following drilling or cut.

I. Equipment shall be protected against mechanical and water damage during cutting and patching. Provide protective covers or use other means such as temporary relocation to protect equipment that is at risk of damage from the cutting and patching.

J. Provide protection for existing equipment, utilities and critical areas against water or other damage caused by drilling operation.

END OF SECTION

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SECTION 01732

PIPE PENETRATIONS

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment, and incidentals required and install pipe penetration assemblies as shown. This Section covers materials for the various pipe penetration configurations as shown on the Drawings.

1.02 MATERIALS COMPLIANCE WITH AIS

A. P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), includes an “American Iron and Steel (AIS)” requirement in section 436 that requires Clean Water State Revolving Loan Fund (CWSRF) and Drinking Water State Revolving Loan Fund (DWSRF) assistance recipients to use iron and steel products that are produced in the United States for projects for the construction, alteration, maintenance, or repair of a public water system or treatment works. This Project meets the definition of such work, and the Environment Protection Agency (EPA) implementation requirements for this AIS requirement are outlined within the DWSRF memorandum titled “Implementation of American Iron and Steel provisions of P.L. 113-76, Consolidated Appropriations Act, 2014” included as part of the RLF Supplemental General Conditions.

B. All parties are required to comply with these requirements and to ensure that all qualifying iron and steel products used in this project must be produced in the United States. See RLF Supplemental General Conditions for additional details.

1.03 RELATED SECTIONS

A. Section 01300 - Submittals

B. Section 01731 – Cutting, Coring and Patching

C. Division 3 – Concrete

D. Division 4 – Masonry

E. Division 9 – Painting

1.04 REFERENCE STANDARDS

A. American Water Works Association (AWWA), latest edition:

1. AWWA C151 Ductile-Iron Pipe, Centrifugally Cast

B. ASTM International (ASTM), latest edition:

1. ASTM A53 Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless

1.05 SUBMITTALS

A. See Section 01300, Submittals, for submittal procedures.

B. Submit manufacturers' literature, installation instructions, and where applicable, fire rating and certified test results of the various components on all items to be furnished.

PART 2 PRODUCTS

2.01 PIPE SLEEVES

A. Pipe sleeves shall be Schedule 40 galvanized steel pipe conforming to ASTM A53. Where indicated, provide a 2-inch minimum circumferential water stop welded to the exterior of the sleeve at its midpoint. Ends of sleeves shall be cut and ground smooth and shall be flush with the wall or ceiling and extend 2 inches above finished floors.

B. Sleeves to be sealed with mechanical seals shall be sized in accordance with the seal manufacturer's recommendations. Sleeves to be sealed by caulking and sleeves for insulated piping shall be sized as required. Where mechanical seals are required, the seal material shall be compatible with the materials conveyed by the pipe. All mechanical seals located in a chemical trench shall be GPT/PSI/Link-Seal Model OS-316 or approved equal.

C. External wall penetrations, 36-inch diameter and less, may be made by means of a ductile iron sleeve capable of being bolted directly to the formwork. Seal of the annular space between the carrier pipe and the sleeve shall be made by means of a confined rubber gasket and be capable of withstanding 350 psi. Sleeve shall have an integrally cast waterstop of 1/2-inch minimum thickness and 2 1/2-inch minimum height. Sleeves shall be by Omni-Sleeve, Malden, MA or equal.

2.02 WALL CASTINGS

A. Unless otherwise shown, wall castings shall be ductile iron conforming to AWWA C151, thickness Class 53, diameter as required. Flanges and/or mechanical joint bells shall be drilled and tapped for studs where flush with the wall. Castings shall be provided with a 2-inch minimum circumferential flange/waterstop integrally cast with or welded to the casting, located as follows: for castings set flush with walls, located at the center of the overall length of the casting; for castings that extend through wall, located within the middle third of the wall.

2.03 SEALING MATERIALS

A. Mechanical seals shall be modular, adjustable, bolted, mechanical type consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe and sleeve. The seal shall be rated by the manufacturer for 40-feet of pressure head or 20 psig. Mechanical seals shall be Link-Seal LS-500, depending on pipe size,

Model S-316 or OS-316 depending on application, by GPT/PSI/Link-Seal, Houston, TX, or approved equal.

B. Sealant shall be a two-part foamed silicone elastomer by Dow Corning Co., Product No. 3-6548 silicone R.T.V.; 3M brand fire barrier products caulk C.P. 25 and 3M brand putty 303; or Flame-Safe fire stop systems Fig. No. FS-500 by Thomas & Betts Corp. Sealant bead configuration, depth and width shall be in accordance with manufacturer's recommendations.

2.04 MISCELLANEOUS MATERIALS

A. Bonding compound shall be Sikadur Hi-Mod epoxy by Sika Corp., Euclid Chemical Corp., Master Builders Company, or approved equal.

B. Non-shrink grout shall be Masterflow 713 by Master Builders Co., Euco N-S by Euclid Chemical Co., Five Star Grout by U.S. Grout Corp., or approved equal.

PART 3 EXECUTION

3.01 INSTALLATION

A. Assemble and install components of pipe penetration assemblies as recommended by product manufacturers and as detailed on the Drawings.

END OF SECTION

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SECTION 01740

CLEANING

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Execute cleaning, during progress of the Work, and at completion of the Work, as required by General Conditions.

1.02 MATERIALS COMPLIANCE WITH AIS

A. P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), includes an “American Iron and Steel (AIS)” requirement in section 436 that requires Clean Water State Revolving Loan Fund (CWSRF) and Drinking Water State Revolving Loan Fund (DWSRF) assistance recipients to use iron and steel products that are produced in the United States for projects for the construction, alteration, maintenance, or repair of a public water system or treatment works. This Project meets the definition of such work, and the Environment Protection Agency (EPA) implementation requirements for this AIS requirement are outlined within the DWSRF memorandum titled “Implementation of American Iron and Steel provisions of P.L. 113-76, Consolidated Appropriations Act, 2014” included as part of the RLF Supplemental General Conditions.

B. All parties are required to comply with these requirements and to ensure that all qualifying iron and steel products used in this project must be produced in the United States. See RLF Supplemental General Conditions for additional details.

1.03 RELATED SECTIONS

A. Section 01562 – Dust Control

1.04 DISPOSAL AND CLEANING

A. Conduct cleaning and disposal operations to comply with all codes, ordinances, regulations, and anti-pollution laws.

PART 2 PRODUCTS

2.01 MATERIALS

A. Use only those cleaning materials which will not create hazards to health or property, and which will not damage surfaces.

B. Use only those cleaning materials and methods recommended by manufacturer of the surface material to be cleaned.

C. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.

PART 3 EXECUTION

3.01 DURING CONSTRUCTION

A. Execute periodic cleaning to keep the work, the site and adjacent properties free from accumulations of waste materials, rubbish and windblown debris, resulting from construction operations.

B. Provide on-site containers for the collection of waste materials, debris and rubbish. Dispose of all waste material daily including containers, food debris, and other miscellaneous materials in on-site containers and/or remove from the site.

C. Remove waste materials, debris, rubbish from the site periodically, and dispose at legal disposal areas away from the site.

3.02 DUST CONTROL

A. Clean interior spaces prior to the start of finished painting and continue cleaning on an as-needed basis until painting is finished.

B. Schedule operations so that dust and other contaminants resulting from cleaning process will not fall on wet or newly coated surfaces.

3.03 FINAL CLEANING

A. Employ skilled workmen for final cleaning.

B. Remove grease, mastic, adhesives, dust, dirt, stains, fingerprints, labels, and other foreign materials from sight-exposed interior and exterior surfaces.

C. Wash and shine glazing and mirrors.

D. Polish glossy surfaces to a clear shine.

E. Ventilating Systems:

1. Clean permanent filters and replace disposable filters if units were operated during construction

2. Clean ducts, blowers, and coils if units were operated without filters during construction

F. Broom clean exterior paved surfaces; rake clean other surfaces of the grounds.

G. Prior to final completion, or Owner occupancy, the Contractor shall thoroughly clean all surfaces including glass, flooring, carpeting, walls, equipment, piping, etc. Wax cabinets and brightwork as required to restore surfaces. The Contractor shall conduct an inspection of sight-exposed interior and exterior surfaces and all work areas, to verify that the entire project is clean.

END OF SECTION

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SECTION 01781

PROJECT RECORD DOCUMENTS

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Maintain one (1) record copy of the following documents at the site for the Owner's use:

1. Drawings showing as-built revisions
2. Specifications showing as-built revisions
3. Duly issued and approved addenda
4. Duly issued and approved Change Orders and other modifications to the Contract
5. Engineer's Field Change Orders and other written instructions
6. Duly processed Requests for Information and documentation
7. Approved Shop Drawings, Material Submittals, Working Drawings, and Samples
8. Field Test Reports
9. Latest approved progress schedule

B. The Owner will not approve progress payments unless Project Record Documents are current with construction progress.

1.02 MATERIALS COMPLIANCE WITH AIS

A. P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), includes an "American Iron and Steel (AIS)" requirement in section 436 that requires Clean Water State Revolving Loan Fund (CWSRF) and Drinking Water State Revolving Loan Fund (DWSRF) assistance recipients to use iron and steel products that are produced in the United States for projects for the construction, alteration, maintenance, or repair of a public water system or treatment works. This Project meets the definition of such work, and the Environment Protection Agency (EPA) implementation requirements for this AIS requirement are outlined within the DWSRF memorandum titled "Implementation of American Iron and Steel provisions of P.L. 113-76, Consolidated Appropriations Act, 2014" included as part of the RLF Supplemental General Conditions.

B. All parties are required to comply with these requirements and to ensure that all qualifying iron and steel products used in this project must be produced in the United States. See RLF Supplemental General Conditions for additional details.

1.03 RELATED SECTIONS

A. Section 01300 - Submittals

B. Section 01782 – Operation and Maintenance Data

C. Section 01783 – Product Warranties

1.04 SUBMITTALS

A. See Section 01300, Submittals, for submittal procedures.

B. At contract closeout, deliver the Record Documents to the Engineer for the Owner. The Record Documents shall generally consist of redlined drawings, specifications, and other information as necessary to accurately represent the completed work.

C. Label all document containers and boxes clearly to indicate their content.

D. Accompany submittals with a transmittal letter in duplicate, containing the following:

1. Date
2. Project title and project number
3. Contractor's name and address
4. Title and number of each Record Document
5. Signatures of the Contractor or his authorized representative certifying that the submittal is complete and as required by the Contract Documents

E. The Owner will not grant Final Acceptance of the project until the Record Documents have been turned over to and approved by the Engineer.

F. Owner reserves the right to withhold retainage fees until after the acceptable Record Documents have been submitted and approved by the Engineer.

PART 2 PRODUCTS

2.01 MARKING DEVICES

A. Provide waterproof felt tip pens as required to maintain as-built drawings described in this section using the following color coding:

1. Red: Document changes
2. Yellow: Work installed without change
3. Orange: Dimensional and other notations
4. Green: Work deleted

2.02 ELECTRONIC MEDIA DRAWINGS

A. Provide drawings, details, and schematics from approved submittals in electronic form per paragraph 3.02.D.

B. All drawings provided in electronic format shall be provided in Portable Document Format (.pdf) with borders and title blocks clearly identifying Contract, equipment, and the scope of the drawing.

C. Drawing quality and size of presentation shall be legible at a 50% reduction of such drawings, and reduced drawings will be used for insertion in Operations and Maintenance manuals.

2.03 PROJECT LAYOUT EQUIPMENT

A. The Contractor shall have the capability of laying out the Work and recording information for the Record Documents using a survey coordinate system established by the Engineer. Layout and recording as-builts shall be accomplished using total station or global positioning system (GPS) equipment.

PART 3 EXECUTION

3.01 MAINTENANCE OF DOCUMENTS AND SAMPLES

A. Store documents and samples in the Contractor's office apart from documents used for construction.

1. Provide files and racks for the storage of documents
2. Provide locked cabinet or secure storage space for the storage of samples

B. File documents and samples in accordance with CSI format.

C. Maintain documents in a clean, dry, legible condition, and in good order. Do not use Record Documents for construction purposes.

D. Make documents and samples available at all times for the inspection by the Engineer.

E. As a prerequisite for monthly progress payments, the Contractor shall exhibit the currently updated "record documents" for the review of the Engineer and Owner. The failure of the Engineer and/or Owner to review the documents shall not relieve the Contractor of the responsibility of their being available and up to date.

3.02 RECORDING

A. Label each document and sample "PROJECT RECORD" with a rubber stamp.

B. Record information monthly and concurrently with construction progress. Do not conceal any work until the required information is recorded.

C. Drawings (hard copies): Legibly mark on full-size drawings to record actual construction noting any variation in materials, equipment, conditions, and dimensions for the following:

1. Elevations of various structure elements in relation to elevation datum:

a. Elevations referenced to control points established by the Engineer
b. Elevations of all structural finished floors and tops of concrete
c. Elevations of all weirs and other flow control devices
d. Bottom of pipe (B/P) or top of pipe (T/P) elevations for all exposed piping, indoors or outdoors

2. All underground piping with elevations and dimensions, changes to piping location, horizontal and vertical locations of underground utilities and appurtenances, reference to permanent surface improvements, actual installed pipe material, class, etc.

    a. Top of pipe or top of concrete (TOC) elevations for all underground pipelines or encased pipes or conduits exposed during construction, whether installed or not. On straight runs of new pipe or conduit, record at least one (1) T/P elevation every 100 feet of pipe or conduit

    b. Coordinates and elevations of site piping, electrical conduits, and duct banks, including starting and ending points and directional changes. Record the horizontal location of every piping or conduit bend (vertical or horizontal), valves, other fittings, or specialty items exposed during construction, whether installed or not. On long, straight runs of pipe or conduit, record similar information between bends and other fittings at least once every 200 feet

    c. Locate all underground utilities, structures, obstacles, etc. encountered during construction, whether being installed or not, in the manner indicated above for underground pipes and conduits

3. All embedded, buried, and concealed features of mechanical piping, site piping, electrical conduit, and structural embedments with elevations and dimensions. Reference to a permanent surface improvement or visible feature all changes to horizontal and vertical locations of pipe, fittings, underground utilities, and appurtenances. Note actual installed pipe materials, class, etc.

4. Depth of foundation elements in relation to ground elevation

5. Field changes of dimensions and details

6. Changes made by Field Change Order or by Change Order

7. Details not on the original Contract Documents

8. Equipment and piping locations

9. Identify the actual motor installed by manufacturer’s name, nameplate horsepower, and serial number

10. Identify the actual pump installed by manufacturer’s name, model number, impeller size, rated capacity, and serial number

11. Major architectural and structural changes, including relocation of doors, windows, etc.

D. Electronic Drawings, Details and Schedules: Provide electronic media copies and original plots on 11 x 17-inch (11” x 17”) bond paper information prepared by the Contractor for construction or installation that is supplemental to the detail on the Contract Drawings and as required in specific specifications. Reference appropriate

Contract Drawings that show the work. Drawings shall be in electronic format for the following:

1. All electrical and instrumentation drawings required to perform and document the work and/or additional information specified elsewhere

2. All schematics of internal wiring of supplied equipment. Provide electronic drawings of all internal wiring of supplied equipment; utilize the equipment supplier's drawings when preparing as-built schematic drawings for connection of said equipment

3. Interconnection diagrams for each cable, scheduled or unscheduled, in the Contract Documents. Prepare schematic diagrams for each control circuit. Diagrams included in the Contract Documents may be used for preparing final as-builts. All additional information such as cable number, wire numbers, terminal numbers, wire colors, and pair numbers shall be added electronically by the Contractor and submitted

4. Schedules for conduit, cables, electrical power, lighting, panels, and other as also may be specified in individual sections. Provide conduit and cable schedules listing actual conduit sizes and routing along with the actual cables carried in each, based on field cable pulling records. Include equipment number and pertinent data, specification number, manufacturer and catalog number, local vendor or manufacturer's representative with address and phone number, warranty number and dates, spare parts recommended and/or provided, and installation date

5. Contractor or supplier prepared fire protection sprinkler and alarm systems and other alarm systems accurately showing the location, size and arrangement of piping, cable appurtenances and controls

6. Field changes of dimensions and details

7. Changes made by Field Change Order or by Change Order

8. Other information as required in the Specifications

E. Specifications and Addenda: Legibly mark each Section to record the following:

1. Manufacturer, trade name, catalog number, and supplier of each product and time of equipment actually installed.

2. Changes made by Field Change Order or by Change Order.

F. Shop Drawings: After final review and approval of shop drawings, provide the following:

1. One (1) set of Engineer approved shop drawings or submittals for each piece of equipment, piping, electrical system, and instrumentation system

3.03 DELIVERY OF PROJECT RECORD DOCUMENTS

A. Record documents will be used to verify and document progress as stated in progress payment request. Work not included in the record drawings will not be included for payment in progress payment requests.

B. Prior to the Contractor's request for a notice of Substantial Completion of any area or system on the project, the Contractor shall transmit Record Documents to the Engineer. The record documents shall include a statement indicating completion of record information for specific areas or, if for project closeout, that the documentation is completed and in compliance with Contract requirements.

C. Revise record documents as a result of any changes made or discovered during project closeout and/or commissioning.

END OF SECTION

SECTION 01782

OPERATION AND MAINTENANCE DATA

PART 1 GENERAL

1.01 SCOPE OF WORK

A. This Section includes procedural requirements for compiling and submitting operation and maintenance (O&M) data required to complete the project.

1.02 MATERIALS COMPLIANCE WITH AIS

A. P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), includes an “American Iron and Steel (AIS)” requirement in section 436 that requires Clean Water State Revolving Loan Fund (CWSRF) and Drinking Water State Revolving Loan Fund (DWSRF) assistance recipients to use iron and steel products that are produced in the United States for projects for the construction, alteration, maintenance, or repair of a public water system or treatment works. This Project meets the definition of such work, and the Environment Protection Agency (EPA) implementation requirements for this AIS requirement are outlined within the DWSRF memorandum titled “Implementation of American Iron and Steel provisions of P.L. 113-76, Consolidated Appropriations Act, 2014” included as part of the RLF Supplemental General Conditions.

B. All parties are required to comply with these requirements and to ensure that all qualifying iron and steel products used in this project must be produced in the United States. See RLF Supplemental General Conditions for additional details.

1.03 RELATED SECTIONS

A. Section 01300 – Submittals

B. Section 01783 – Product Warranties

C. Section 01810 – Equipment Testing and Start-Up

1.04 SUBMITTALS

A. Submit one (1) preliminary electronic draft copy of proposed formats and content outlines of Operation and Maintenance Manuals within 30 days after the effective date of the Agreement. The Engineer will review the preliminary draft and return one (1) copy with comments.

B. Submit one (1) preliminary electronic copy of O&M manuals covering all equipment furnished under Divisions 11, 13, 14, 15, and 16 no later than 30 days following the Engineer's review of the last shop drawing and/or other submittal specified under Section 01300. One (1) copy will be returned with comments to be incorporated into final copies. Submit O&M manuals on Division 2 products only if specifically required by the respective Division 2 specifications.

C. Prior to equipment delivery, submit one (1) video demonstrating how to perform routine equipment maintenance activities (daily, weekly, monthly, bimonthly, quarterly, and annual manufacturer recommended activities) covering all equipment under Divisions 11 and 13. Equipment supplied under other divisions does not need a training video to be supplied.

D. Submit four (4) copies of approved O&M manuals with electronic copies in final form covering all equipment under Divisions 11, 13, 14, 15, and 16 within 30 calendar days of product shipment to the project site and preferably within 30 days after the reviewed copy is received. O&M manuals for piping and piping accessories under Divisions 2 and 15 are not required unless specifically requested by the Engineer.

E. Final installation photos of major equipment under Divisions 11, 13, 14, 15, and 16 must be included in final O&M manuals. Submit a list of equipment O&M manuals requiring installation photos to the Engineer for approval within 30 days of the effective date of the Agreement.

F. Submit six (6) copies of addendum to the O&M manuals, as applicable, including updated electronic copies and certificates within 30 days after final inspection and equipment start-up. See Section 01810, Equipment Testing and Start-Up.

G. Deliver all copies to the Resident Engineer on-site or to the Engineer at the following address: Hawkins-Weir Engineers, Inc., 516 East Millsap Road, Suite 103, Fayetteville, Arkansas 72703.

1.05 SERVICES OF MANUFACTURERS' REPRESENTATIVE

A. Coordinate the preparation of O&M manuals with the equipment start-up and training specified in Section 01810, Equipment Testing and Start-Up. Include by addendum copies of the Equipment Manufacturer’s Certificate of Installation, Testing and Instruction in the O&M manuals.

PART 2 PRODUCTS

2.01 GENERAL CONTENTS

A. Cover Sheet: Provide Owner’s name; title of project and project number; date; name of equipment and submittal tracking number (per Section 01300, Submittals); and the names, addresses and telephone numbers of the Contractor, subcontractor, and Engineer.

B. Table of Contents: Provide title of project and project number, and a schedule of products and systems, indexed to content of the volume. Electronic O&M copies shall have similar indexing of the major sections of the manual to a table of contents within the PDF file.

C. For Each Product or System: List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.

D. Product Data: Mark each sheet to clearly identify specific products and component parts and data applicable to installation. Delete or cross out inapplicable information.

E. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Dimensions shall be in English units. Do not use Project Record Documents as maintenance drawings. However, coordinate drawings with information in the Project Record Documents to assure correct illustration of completed installation.

F. Manual Text and Instructions: Include as required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified. All manufacturers will provide O&M manuals in English and Imperial units. All translations from foreign languages to English or metric units to Imperial units will be verified during the preparation of the manual before submittal to the Engineer.

G. Installation Photos: Include final installation photos of major pieces of equipment.

H. Product Warranties: Include copies as specified in Section 01783, Product Warranties.

I. Electronic Copies: Provide electronic files in portable document format (PDF) or other approved format and index all files. Owner shall be authorized to make additional copies.

2.02 OPERATION AND MAINTENANCE MANUALS

A. The O&M manual for each piece of equipment for Engineer’s review shall be a separate, bound document with the following specific requirements:

1. Contents:

a. Table of contents and index

b. Major Equipment Summary Table including equipment name, model number, serial number, a brief description of each system and component, and other pertinent information

c. Drawings showing the location of the equipment

d. Starting and stopping procedures

e. Special operating instructions

f. Routine maintenance procedure

g. Manufacturer's printed operation and maintenance instructions, parts list and current prices, illustrations, and diagrams

h. One (1) copy of each wiring diagram

i. One (1) copy of each approved Shop Drawing and each Contractor's coordination and layout drawing

j. List of spare parts, manufacturer's price, and recommended quantity

k. Name, address, and telephone numbers of local service representatives

2. Material:

a. Loose leaf on 20-lb punched paper

b. Holes reinforced with plastic, cloth or metal

c. Page size, 8½ by 11-inch (8½ " x 11")

d. Diagrams, illustrations, and attached foldouts as required and of original quality. Reduce larger drawings and fold to size of text pages, but not larger than 11 by 17-inch (11" x 17")

e. Provide a flyleaf for each separate product, or each piece of operation equipment. Provide indexed tabs and a typed description of the product or component on each flyleaf

f. Covers: commercial quality three-ring binders with durable and cleanable plastic covers; oil, moisture and wear resistant; 9 by 12-inch (9" x 12") size. Identify each volume on the cover and on the spine with the printed title “OPERATION AND MAINTENANCE INSTRUCTIONS” along with the project title, general subject matter, and submittal tracking number as defined in Section 01300, Submittals

3. Electronic Copy: Include one (1) electronic copy, by compact disc (CD) or DVD, with each copy of the final O&M manual. Other methods of delivery may be submitted to the Engineer for approval.

4. Certificate: Submit a copy of the Equipment Manufacturer’s Certificate of Installation, Testing and Instruction by addendum following successful start-up of equipment and training of Owner’s personnel (see Section 01810, Equipment Startup and Testing). Provide certificates with reinforced holes punched for the 3-ring binder as described above.

2.03 MANUAL FOR MATERIALS AND FINISHES

A. Manual content, layout, materials, and number of copies for Materials and Finishes shall be similar to those for Operation and Maintenance Manuals for equipment as described above.

B. Building Products, Applied Materials and Finishes: Include product data, with catalog number, size, composition and color and texture designations. Provide information for re-ordering custom manufactured products.

C. Instructions for Care and Maintenance: Include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods and recommended schedule for cleaning and maintenance.

D. Moisture Protection and Weather Exposed Products: Include product data listing, applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.

E. Additional Requirements: As specified in individual product specifications.

F. Provide a listing in Table of Contents for design data, if provided by Contractor, with tabbed flysheet and space for insertion of data.

2.04 MANUAL FOR EQUIPMENT INCLUDING ELECTRIC AND ELECTRONIC SYSTEMS

A. Manual content, layout, materials, and number of copies for Electric and Electronic Systems shall be similar to those for Operation and Maintenance Manuals for equipment as described above.

B. For each Item of Equipment and each System provide the following:

1. Overview of System and description of unit or system and component parts. Identify function, normal operating characteristics and limiting conditions. Include performance curves, with engineering data and tests and complete nomenclature and commercial number of replaceable parts.

2. Panelboard Circuit Directories including electrical service characteristics, controls and communications and color-coded wiring diagrams as installed.

3. Operating Procedures: Include start-up, break-in and routine normal operating instructions and sequences; regulation, control, stopping, shut-down and emergency instructions; and summer, winter and any special operating instructions.

4. Maintenance Requirements:

a. Routine procedures and guide for trouble-shooting; disassembly, repair and reassemble instructions; and alignment, adjusting, balancing, and checking instructions

b. Servicing and lubrication schedule and list of lubricants required

c. Manufacturer's printed operation and maintenance instructions

d. Sequence of operation by controls manufacturer

e. Original manufacturer's parts list, illustrations, assembly drawings and diagrams required for maintenance

5. Control diagrams by controls manufacturer as installed

6. Contractor's coordination drawings, with color-coded piping diagrams as installed

7. Charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams

8. List of original manufacturer's spare parts, current prices and recommended quantities to be maintained in storage. Indicate predicted life of parts subject to wear

9. Test and balancing reports as specified

10. Additional Requirements: As specified in individual product specification

C. Provide a listing in Table of Contents for design data, if provided by Contractor, with tabbed flysheet and space for insertion of data.

PART 3 EXECUTION

3.01 INSTRUCTION OF OWNER'S PERSONNEL

A. Before final inspection, instruct Owner's designated personnel in operation, adjustment and maintenance of products, equipment, and systems, at times scheduled by the Engineer. Instruction and training may be conducted in conjunction with the final acceptance testing and start-up as defined in Section 01810, Equipment Testing and Start-Up. Provide documentation in the O&M Manuals of testing, start-up, and training of Owner's personnel.

B. The Owner reserves the right to record the training sessions for later use as O&M instruction.

C. Include specific instructions for equipment designed for seasonal operation, and include details for weatherization, decommissioning, etc. as necessary in the O&M Manuals.

D. Use approved copies of the O&M manuals as basis for instruction for Owner's personnel. Review contents of manual with personnel in detail to explain all aspects of operation and maintenance.

E. Prepare and insert additional data in Operation and Maintenance Manual when need for such data becomes apparent during instruction.

END OF SECTION

SECTION 01783

PRODUCT WARRANTIES

PART 1 GENERAL

1.01 SCOPE OF WORK

A. This Section specifies general administrative and procedural requirements for warranties required by the Contract Documents, including manufacturers' standard warranties on products and special warranties.

B. For all major pieces of equipment, submit a warranty from the equipment manufacturer. The manufacturer's warranty period shall be concurrent with the Contractor's one-year (1-year) correction period defined in the Contract Documents. Unless otherwise specified, the manufacturer's warranty shall commence on the date established and accepted by the Owner as Substantial Completion.

C. Obtain certificates for equipment warranty for all major equipment as required in Division 2 through 16 specifications. The Owner reserves the right to request warranties for equipment not classified as major. The Contractor shall still warrant all materials and equipment in the Contractor's 1-year warranty period even though certificates of warranty may not be specifically required.

D. If the equipment manufacturer or supplier is unwilling to provide a 1-year warranty commencing at the time of Substantial Completion, obtain from the manufacturer a two-year (2-year) warranty commencing at the time of equipment delivery to the job site. This 2-year warranty from the manufacturer shall not relieve the Contractor of the 1-year warranty commencing at the Owner-accepted date of Substantial Completion. Equipment not in operation at or accepted for operation at the date of Substantial Completion shall have a warranty from the date of final acceptance by the Owner.

E. Warrant the installation of all existing equipment to be rebuilt or relocated under the 1-year correction period as defined in the Contract Documents. The warranty shall only cover the labor, methods and materials used for rebuilding and/or relocation, and any new parts installed on the existing equipment. Provide a separate manufacturer's warranty on newly installed parts as requested by the Owner. The warranty period shall commence one (1) year from the date of relocation of the equipment unless otherwise specified by the Engineer.

1.02 MATERIALS COMPLIANCE WITH AIS

A. P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), includes an "American Iron and Steel (AIS)" requirement in section 436 that requires Clean Water State Revolving Loan Fund (CWSRF) and Drinking Water State Revolving Loan Fund (DWSRF) assistance recipients to use iron and steel products that are produced in the United States for projects for the construction, alteration, maintenance, or repair of a public water system or treatment works. This Project meets the definition of such work, and the Environment Protection Agency (EPA) implementation requirements for this AIS requirement are outlined within the DWSRF memorandum titled "Implementation of

American Iron and Steel provisions of P.L. 113-76, Consolidated Appropriations Act, 2014" included as part of the RLF Supplemental General Conditions.

B. All parties are required to comply with these requirements and to ensure that all qualifying iron and steel products used in this project must be produced in the United States. See RLF Supplemental General Conditions for additional details.

1.03 RELATED SECTIONS

A. Section 01300 – Submittals

B. Section 01782 – Operation and Maintenance Data

C. Division 2 through 16: Refer to specific requirements for warranties for the work, products and installations that are specified to be warranted.

1.04 DEFINITIONS

A. S*tandard Product Warranties* – Preprinted written warranties published by individual manufacturers for products that are specifically endorsed by the manufacturer to the Owner.

B. *Special Warranties* – Written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the Owner.

1.05 SUBMITTALS

A. Submit written warranties to the Engineer for review prior to the date fixed by the Owner for Substantial Completion. If the Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the Work, or a designated portion of the Work, submit written warranties upon request of the Owner.

B. A copy of the manufacturer's warranty must be included in the Contractor's equipment submittal for review by the Engineer.

PART 2 PRODUCTS

A. When a designated portion of the Work is completed and occupied or used by the Owner, by separate agreement between the Owner and the Contractor during the construction period, submit properly executed warranties to the Owner within fifteen (15) days of completion of that designated portion of the Work. Unless otherwise negotiated in the separate agreement, the Contractor's 1-year warranty and all associated manufacturers' warranties shall commence on the date established and accepted by the Owner as substantial completion for that portion of the Work.

B. When a special warranty is required to be executed by the Contractor; or the Contractor and a subcontractor, supplier or manufacturer; prepare a written document that contains

appropriate terms and identification, ready for execution by the required parties. Submit a draft to the Engineer for review and for Owner's approval prior to final execution.

C. Refer to individual Sections of Divisions 2 through 16 for specific content requirements for submittal of special warranties.

D. At Final Completion, compile two (2) copies of each required warranty properly executed by the Contractor, or by the Contractor, subcontractor, supplier, or manufacturer. Organize the warranty documents into an orderly sequence based on the Table of Contents of the Project Manual.

E. Bind warranties in heavy-duty, commercial quality, durable 3-ring clear plastic covered loose-leaf binders, thickness as necessary to accommodate contents and sized to receive 8½ x 11-inch (8½" x 11") paper.

F. Cover: Identify each binder with typed or printed title "PRODUCT WARRANTIES." List the title of the Project, Owner's project number, and the names of the Owner, Contractor, Engineer, Manufacturer and/or Manufacturer's Local Representative.

G. Table of Contents: Include a neatly typed Table of Contents in the sequence of the Project Manual, with each item identified with the number and title of the Section in which it is specified and the name of the product or work item.

H. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark the tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address and telephone number of the installer, supplier, and manufacturer.

I. When operating and maintenance manuals are required for warranted construction, provide additional copies of each required warranty for inclusion in each warranty manual.

PART 3 EXECUTION

3.01 WARRANTY REQUIREMENTS

A. Related Damages and Losses: When correcting warranted work that has failed, remove and replace other work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted work.

B. Reinstatement of Warranty: When work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty for all replaced or rebuilt parts or replaced work as a whole.

C. Replacement Cost: Upon determination that work covered by a warranty has failed, replace or rebuild the work to an acceptable condition complying with requirements of Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective work regardless of whether the Owner has benefited from use of the work through a portion of its anticipated useful service life.

D. Owner's Recourse: Written warranties made to the Owner are in addition to implied warranties, and shall not limit the duties, obligations, rights, and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights, or remedies.

E. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents.

F. The Owner reserves the right to refuse to accept work for the project where a special warranty, certification, or similar commitment is required on such work or part of the work, until evidence is presented that entities required to countersign such commitments are willing to do so.

G. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the work that incorporates the products, nor does it relieve suppliers, manufacturers and subcontractors required to countersign special warranties with the Contractor.

H. The Contractor’s 1-year warranty of the Work shall be included under the performance bond required for the Project. If required under other sections of the specifications, the Contractor shall provide a separate bond(s) for extended warranties for materials and equipment.

I. Separate Prime Contracts: Each Prime Contractor is responsible for warranties related to its own Contract.

3.02 MANUFACTURERS CERTIFICATIONS

A. Where required, the Contractor shall supply evidence, satisfactory to the Engineer, that the Contractor can obtain manufacturers’ certifications as to the Contractor’s installation of equipment.

END OF SECTION

SECTION 01810

EQUIPMENT TESTING AND START-UP

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Provide a manufacturer's field services technician for all equipment furnished under Divisions 11, 13, 14, 15, and 16 to do the following:

1. Supervise installation, adjustment, and initial operation and testing

2. Conduct performance and final acceptance testing

3. Conduct startup of the equipment and training of the Owner's staff

4. Verify that all spare parts have been delivered to the project site and that they are in satisfactory condition for use by the Owner

B. Perform specified equipment field performance tests, final acceptance tests and start-up services as identified in individual Sections of these Specifications.

1.02 MATERIALS COMPLIANCE WITH AIS

A. P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), includes an "American Iron and Steel (AIS)" requirement in section 436 that requires Clean Water State Revolving Loan Fund (CWSRF) and Drinking Water State Revolving Loan Fund (DWSRF) assistance recipients to use iron and steel products that are produced in the United States for projects for the construction, alteration, maintenance, or repair of a public water system or treatment works. This Project meets the definition of such work, and the Environment Protection Agency (EPA) implementation requirements for this AIS requirement are outlined within the DWSRF memorandum titled "Implementation of American Iron and Steel provisions of P.L. 113-76, Consolidated Appropriations Act, 2014" included as part of the RLF Supplemental General Conditions.

B. All parties are required to comply with these requirements and to ensure that all qualifying iron and steel products used in this project must be produced in the United States. See RLF Supplemental General Conditions for additional details.

1.03 RELATED SECTIONS

A. Section 01170 – Special Provisions

B. Section 01300 – Submittals

C. Section 01480 – Watertightness Test for Hydraulic Structures

D. Section 01666 – Testing of Pipelines

E. Section 01782 – Operation and Maintenance Data

F. Section 01820 – Demonstration and Training

G. Performance and acceptance testing, and start-up requirements are included in the respective sections of Divisions 11, 13, 14, 15, and 16.

1.04 REFERENCE STANDARDS

A. Standards for the quality of component materials and for testing certifications are defined in the individual specification Section for each piece of equipment.

1.05 SUBMITTALS

A. See Section 01300, Submittals for submittal procedures.

B. Submit name, address, and resume of proposed field services technicians at least 30 days in advance of the need for such services.

C. Submit detailed testing procedures for shop tests, field performance tests and final acceptance tests as specified in the various equipment sections. Submittals shall include the following:

1. Test procedures shall be submitted at least 30 days in advance of the proposed test dates and shall include at least the following information:

   a. Name of equipment to be tested, including reference to specification Section number and title

   b. Testing schedule of proposed dates and times for testing

   c. Summary of power, lighting, chemical, water, drainage, sludge, and gas needs and identification of who will provide them

   d. Outline specific assignment of the responsibilities of the Contractor and manufacturer's factory representative or field service personnel

   e. Detailed description of step-by-step testing requirements, with reference to appropriate standardized testing procedures and laboratory analyses by established technical organizations (e.g., ASTM, Standard Methods, etc.)

   f. Samples of forms to be used to collect and record test data and to present tabulated test results

2. Provide copies of test reports upon completion of specified shop, performance and acceptance tests. Test reports shall incorporate the information provided in the test procedure submittals, modified as necessary to reflect any changes in procedures during the test, along with the following additional information:
   a. Copy of all test data sheets and results of lab analyses

b. Summary comparison of specified test and performance requirements versus actual test results

c. Should actual test results fail to meet specified test and performance requirements, describe action to be taken prior to re-testing the equipment

3. Provide copies of the manufacturer's field service technician's report summarizing the results of the initial inspection, operation, adjustment and pre-tests. The report shall include detailed descriptions and tabulations of the points inspected, tests and adjustments made, quantitative results obtained, suggestions for precautions to be taken to ensure proper maintenance, and the equipment supplier's Certificate of Installation, Testing and Instruction in the format specified herein.

1.06 QUALITY ASSURANCE

A. Field service technicians shall be competent and experienced in the proper installation, adjustment, operation, testing and start-up of the equipment and systems being installed.

B. Manufacturers' sales and marketing personnel will not be accepted as field service technicians.

1.07 SERVICES OF MANUFACTURERS' REPRESENTATIVE

A. Equipment furnished under Divisions 11, 13, 14, 15, and 16 shall include the cost of a competent representative of the equipment manufacturer to supervise the installation, adjustment and testing of the equipment, and to instruct the Owner's operating personnel on operation and maintenance procedures. This supervision may be divided into two (2) or more time periods as required by the installation program or as directed by the Engineer.

B. See the detailed Specifications for additional requirements for furnishing the services of manufacturer's representatives, including the requirements for on-site training.

C. For equipment furnished under Sections of the Specifications other than those listed in Paragraph 1.01.A, furnish the services of the manufacturer’s field services technician for start-up, testing and training as required in those specific Sections, or when in the opinion of the Engineer, some evident malfunction or manufacturing problem makes such services necessary.

PART 2 PRODUCTS

A. For each piece of equipment, submit a certification from the manufacturer or authorized manufacturer’s representative, using the form attached to this Section, stating that the installation of the equipment is satisfactory. The certification shall further state that the unit has been satisfactorily tested, is ready for operation, and that the operating personnel have been suitably instructed in the operation, maintenance, lubrication, and care of the unit. The Owner’s personnel shall acknowledge receipt of training on the certification form.

PART 3 EXECUTION

A. PRELIMINARY REQUIREMENTS

B. After installation of the equipment has been completed and the equipment is presumably ready for operation, but before it is operated by others, the manufacturer's field service technician shall inspect, operate, test and adjust the equipment. The inspection shall include at least the following points where applicable:

1. Soundness (without cracked or otherwise damaged parts)
2. Completeness in all details, as specified and required
3. Correctness of setting, alignment, and relative arrangement of various parts
4. Adequacy and correctness of packing, sealing and lubricants

C. The operation, testing and adjustment shall be as required to prove that the equipment has been left in proper condition for satisfactory operation under the conditions specified.

D. Upon completion of this work, the manufacturer's field service technician shall submit a signed report of the results of the inspection, operation, adjustments, and tests.

3.02 WITNESS REQUIREMENTS

A. Shop tests or factory tests may be witnessed by the Owner and/or Owner's representatives, as required by the various equipment specifications.

B. Field performance and acceptance tests shall be performed in the presence of the Owner, the Owner's designated personnel and/or Owner's representatives.

3.03 START-UP AND ACCEPTANCE

A. General Requirements

1. Successfully perform the step-by-step procedure of start-up and demonstrate all equipment features and systems as specified herein

2. Execute the start-up and performance demonstration prior to Substantial Completion and acceptance by the Owner

3. Schedule all performance tests and inspections at least five (5) working days in advance or as otherwise specified by the Owner and the Engineer. Conduct all performance tests and inspections during the workweek of Monday through Friday, unless otherwise specified

B. Preparation for Start-Up

1. Upon completion of the hydraulic structures and all related piping and systems, flush all valves, fitting, and lines with potable water; and hydraulically test them for leaks, cracks, and defects in accordance with the Specifications.

2. Inspect all mechanical and electrical equipment to ensure that they are in good working order and properly connected. Conduct preliminary run-ins of the various

pumps, compressors, and other remaining equipment. Clean and purge all systems as required. Following hydraulic testing and when directed by the Engineer, drain all sumps, tanks, basins, chambers, pump wells and pipelines.

3. Calibrate all instruments and controls through their full range. Make all other adjustments required for proper operation of all instrumentation and control equipment.

4. Perform all other tasks needed for preparing and conditioning the equipment and controls for proper operation.

5. No testing or equipment operation shall take place until the Contractor has verified for the Engineer that all specified safety equipment has been installed and is in good working order.

6. No testing or equipment operation shall take place until the Contractor has verified for the Engineer that all lubricants, tools, maintenance equipment, spare parts and approved equipment operation and maintenance manuals have been furnished as specified.

C. Facilities Start-Up

1. Start-up period shall not begin until all mechanical and electrical equipment has been tested as specified and is ready for operation. The Owner shall receive spare parts, safety equipment, tools and maintenance equipment, lubricants, approved operation and maintenance data, and the specified operation and maintenance instruction prior to the start-up. Complete all valve tagging, when required, prior to this start-up.

2. Demonstrate a seven (7) consecutive, 24-hour day period of successful operation of the facility as a prerequisite of Substantial Completion and Acceptance. Any variation of the length of the demonstration period shall be approved by the Owner.

3. Upon the failure to demonstrate satisfactory performance of the facility on the first or any subsequent attempt, make all necessary alterations, adjustments, repairs, and replacements at no additional cost to the Owner. When the facility is again ready for operation, schedule a new start-up test with the Engineer. Repeat this procedure as often as necessary until the facility has operated continuously, for the specified duration, to the satisfaction of the Engineer and the Owner.

4. The Owner will furnish all operating personnel (other than vendor's or subcontractor's service personnel) needed to operate equipment during the final test period; however, said personnel will perform their duties under Contractor's direct supervision. Until performance tests are completed, and units and systems are accepted by the Owner as Substantially Complete, the Contractor shall be fully responsible for the operation and maintenance of all new facilities.

5. The Contractor shall provide all necessary personnel of the various construction trades, i.e., electricians, plumbers, etc., and field service personnel of the major equipment suppliers on an 8-hour per day basis at the facilities and on a 24-hour per day basis locally during the start-up period. Manufacturers of major equipment

supplied under Divisions 11, 13, 14, 15 and 16 shall provide factory-trained staff or authorized representatives qualified to conduct equipment start-up as required under the individual Sections.

6. Unless specified elsewhere, the Contractor shall be responsible for all monthly electrical service charges during equipment testing and start-up.

7. At no time during start-up should any new or existing equipment or systems be allowed to operate in excess of the maximum operating conditions for which the equipment has been designed.

3.04 OPERATOR TRAINING

A. Operator Training shall be as specified in the Demonstration and Training section.

END OF SECTION

EQUIPMENT MANUFACTURER'S CERTIFICATE OF INSTALLATION, TESTING AND INSTRUCTION

Owner: City of Bentonville, Arkansas

Project: Bentonville WRRF Improvements

Contract No.: 2021037

Equipment Specification Section: _____

Equipment Description: _____

CERTIFICATION OF INSTALLATION, TESTING AND INSTRUCTION

I hereby certify that _____
Equipment Name and Model with Serial No.

Manufactured by _____
Manufacturer's Name

[has] [have] been installed for the Project in a satisfactory manner; [has] [have] been satisfactorily tested; and [is] [are] ready for operation. I further certify that Owner's assigned operating personnel have been suitably instructed in the operation, lubrication, and care of the

unit[s] on Date: _____ Time: _____

CERTIFIED BY: _____ _____
Signature of Manufacturer's Representative Date

_____
Name of Manufacturer's Representative Name of Representative's Company (if different)

Authorized representative of _____
Manufacturer's Name

OWNER'S ACKNOWLEDGMENT OF MANUFACTURER'S INSTRUCTION

[I] [We] the undersigned, authorized representatives of the City of Bentonville, Arkansas and/or Plant Operating Personnel have received classroom and hands on instruction on the operation, lubrication, and maintenance of the subject equipment and [am] [are] prepared to assume normal operational responsibility for the equipment subject to acceptance by the Owner:

_____ Date: _____

_____ Date: _____

_____ Date: _____

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SECTION 01820

DEMONSTRATION AND TRAINING

PART 1 GENERAL

1.01 DESCRIPTION

A. This section contains requirements for training the Owner's personnel in the proper operation and maintenance of the equipment and systems installed under this contract.

1.02 MATERIAL COMPLIANCE WITH AIS

A. P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), includes an "American Iron and Steel (AIS)" requirement in section 436 that requires Clean Water State Revolving Loan Fund (CWSRF) and Drinking Water State Revolving Loan Fund (DWSRF) assistance recipients to use iron and steel products that are produced in the United States for projects for the construction, alteration, maintenance, or repair of a public water system or treatment works. This Project meets the definition of such work, and the Environment Protection Agency (EPA) implementation requirements for this AIS requirement are outlined within the DWSRF memorandum titled "Implementation of American Iron and Steel provisions of P.L. 113-76, Consolidated Appropriations Act, 2014" included as part of the RLF Supplemental General Conditions.

B. All parties are required to comply with these requirements and to ensure that all qualifying iron and steel products used in this project must be produced in the United States. See RLF Supplemental General Conditions for additional details.

1.03 GENERAL

A. Where indicated in the equipment sections the manufacturer's representative shall provide on-the-job training of the Owner's personnel. The training sessions shall be conducted by qualified, experienced, factory trained representatives of the various equipment manufacturers. Training shall include instruction in both operation and maintenance of the subject equipment.

1.04 SUBMITTALS

A. The following information shall be submitted to the Engineer in accordance with the provisions of the Submittals section. The material shall be submitted not less than 4 weeks prior to the provision of training.

B. Lesson plans, training manuals, handouts, visual aids, and other reference materials for each training session to be conducted by the manufacturer's representatives.

1. Subject of each training session, identity and qualifications of individuals to be conducting the training, and tentative date and time of each training session.

PART 2 PRODUCTS

2.01 GENERAL

A. Where specified, the Contractor shall conduct training sessions for the Owner's personnel to instruct staff on the proper operation, care, and maintenance of the equipment and systems installed under this contract. Training shall take place at the site of the work and under the conditions specified in the following paragraphs. Approved operation and maintenance manuals shall be available at least 30 days prior to the date schedule for the individual training session.

2.02 LOCATION

A. Training sessions shall take place at the site of the work at a location designated by the Owner.

2.03 LESSON PLANS

A. Formal written lesson plans shall be prepared for each training session. Lesson plans shall contain an outline of the material to be presented along with a description of the visual aids to be utilized during the sessions. Each plan shall contain time allocation for each subject.

B. One complete set of originals of the lesson plans, training manuals, handouts, visual aids and reference materials shall be the property of the Owner and shall be suitable bound for proper organization and easy reproduction. The Contractor shall furnish ten copies of necessary training manuals, handouts, visual aids, and reference materials at least 1 week prior to each training session.

2.04 FORMAT AND CONTENT

A. Each training session shall include classroom and time at the location of the subject equipment or system. As a minimum, training sessions shall cover the following subjects for each item of equipment or system:

1. Familiarization

    a. Review catalog, parts lists, drawings, etc., which have been previously provided for the plan files and operation and maintenance manuals.

    b. Guided inspection of the subject equipment.

    c. Demonstration of the subject equipment and how operation in accordance with the specified requirements.

2. Safety

    a. Review and demonstration of safety procedures and related documentation.

    b. Inspection and discussion of hazardous components of the subject equipment.

3. Operation

    a. Review of subject equipment operations literature and theory of operation.

    b. Overview of equipment operation and function.

    c. Explanation and demonstration of all modes of operation including start up, shut down, normal, and emergency operation, and manual and automatic operation through the plant control system.

    d. Explanation of all hardwired interlocks.

    e. Explanation and demonstration of equipment related valves and their purpose.

    f. Explanation of all equipment related instruments including primary element, instrument indicator, purpose, and interpretation of information.

    g. Check out of Owner's personnel on proper use of the equipment.

4. Preventive maintenance

    a. Review preventative maintenance documentation and discussion of maintenance require at various intervals; e.g. daily, weekly, monthly, annually.

    b. Demonstrate performance of each preventive maintenance task.

    c. Identification of indicators of equipment problems.

    d. Discussion of corrosion protection and lubrication requirements.

    e. Requirements for periodic exercise of equipment and demonstration of equipment exercise where required.

    f. Identification of inspection points and demonstration of inspection covers removal and routine disassembly and assembly of equipment.

5. Corrective Maintenance and Equipment Repair

    a. Discussion of common repairs and identification of special problems.

    b. Explanation and demonstration of equipment inspection and troubleshooting.

    c. Demonstration of calibration procedures.

    d. Demonstration of repair procedures where practical.

6. Parts

    a. Discussion of the parts list and ordering of parts.

b. Review of spare parts provided with the equipment and identification of other recommended spare part.

7. Local Representatives

a. Name, address, telephone of local representative.

b. Review of contact information for providers of routine and emergency repair and operational assistance.

8. Operation and Maintenance Manuals

a. Review of O&M manual content and organization.

b. Update O&M material as required.

2.05 VIDEO RECORDING

A. The Contractor shall record each training session and shall give the Owner exclusive rights to each training session recording. The Contractor shall advise all manufacturers providing training sessions that the material will be recorded.

PART 3 EXECUTION

3.01 OPERATOR TRAINING

A. Equipment furnished under Divisions 11, 13, 14, 15 and 16 shall include the cost of a competent representative of the equipment manufacturer to instruct the Owner's operating personnel on operation and maintenance procedures. This supervision may be divided into two (2) or more time periods as required by the installation program or as directed by the Engineer.

B. Training shall be conducted in conjunction with the operational testing and commissioning periods defined in Equipment Testing and Start-up. Classes shall be scheduled so that training is performed when equipment is available for operation. The Contractor shall arrange to have the training conducted on consecutive days, with no more than 6 hours of class scheduled for any one day. Concurrent classes will not be permitted.

C. See the detailed specification Sections for additional requirements for furnishing the services of manufacturers' representatives to provide on-site training. When approved by the Engineer, start-up and training may be conducted at the same time.

D. For each piece of equipment, submit a certification from the manufacturer or authorized manufacturer's representative, using the form attached to this Section, stating that the operating personnel have been suitably instructed in the operation, maintenance, lubrication, and care of the unit. The Owner's personnel shall acknowledge receipt of training on the certification form.

END OF SECTION

SECTION 02050

DEMOLITION AND MODIFICATIONS

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment, and incidentals required; and demolish, modify, remove, and dispose of work shown on the Drawings and as specified herein.

B. The work shall include demolition, modification, and removal of existing materials; and furnishing equipment or work necessary to install the new work, and to connect with existing work in an approved manner.

C. Demolition, modifications, and removals specified under other sections of these Specifications shall conform to requirements of this Section.

D. Site demolition work includes all concrete slabs and other flatwork; asphalt and concrete pavements; buried water, drainage piping; buried or underground structures, vaults; and other ancillary items and materials as shown on the Drawings.

E. Building demolition work includes all building contents, foundations and structures, equipment, piping, valves, miscellaneous metals, electrical switchgear, and other ancillary items and materials as shown on the Drawings.

F. Dispose of all demolished materials and other debris off-site.

G. Blasting and the use of explosives will not be permitted for any demolition work.

1.02 MATERIALS COMPLIANCE WITH AIS

A. P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), includes an “American Iron and Steel (AIS)” requirement in section 436 that requires Clean Water State Revolving Loan Fund (CWSRF) and Drinking Water State Revolving Loan Fund (DWSRF) assistance recipients to use iron and steel products that are produced in the United States for projects for the construction, alteration, maintenance, or repair of a public water system or treatment works. This Project meets the definition of such work, and the Environment Protection Agency (EPA) implementation requirements for this AIS requirement are outlined within the DWSRF memorandum titled “Implementation of American Iron and Steel provisions of P.L. 113-76, Consolidated Appropriations Act, 2014” included as part of the RLF Supplemental General Conditions.

B. All parties are required to comply with these requirements and to ensure that all qualifying iron and steel products used in this project must be produced in the United States. See RLF Supplemental General Conditions for additional details.

1.03 RELATED SECTIONS

A. Section 01111 – Site Conditions

B. Section 01170 – Special Provisions

C. Section 01300 – Submittals

D. Section 01350 – Environmental Protection Procedures

E. Section 01562 – Dust Control

F. Section 01666 – Testing of Pipelines

G. Section 02070 – Selective Demolition

H. Section 02100 – Site Preparation

I. Section 02315 – Excavation, Trenching and Backfilling

J. Section 02316 – Structural Excavation, Backfilling and Grading

K. Section 02501 – Pavement and Drainage Improvements

1.04 SUBMITTALS

A. See Section 01300, Submittals, for submittal procedures.

B. Submit proposed methods and operations of demolition and modifications of structures prior to the start of work. Include a schedule of shutoff, capping, and/or continuation of utility services as required.

C. Furnish a detailed sequence of demolition and removal work to ensure the uninterrupted progress of the Owner's operations. Demolition and removal sequence shall be compatible with sequence of construction and shutdown coordination requirements.

1.05 SCHEDULING

A. At least 48 hours prior to commencing minor demolition or removal, notify the Engineer in writing of the proposed schedule. The Owner shall inspect any affected existing equipment and identify those items that are to remain the property of the Owner. No removals shall start without authorization from the Engineer.

B. At least 30 days prior to commencing major structure or building demolition, notify the Engineer of the proposed schedule. Coordinate with the Engineer and Owner in the preparation of any regulatory permitting for demolition or hazardous material removal. No demolition work shall start without authorization from the Engineer.

C. Before commencing demolition work, complete all modifications necessary to bypass the affected structure. Actual work shall not begin until the Owner and Engineer have inspected and approved the modifications, and commencement of the demolition work has been authorized.

D. Schedule and carry out demolition work to avoid interference with operations and work in existing facilities.

1.06 PROJECT SITE CONDITIONS

A. The Owner and the Engineer assume no responsibility for the actual condition of the structures to be demolished or modified.

B. The Owner will maintain building and site conditions existing at the time of bidding insofar as practical. However, variations within a structure or at the site may occur prior to the start of demolition work.

C. Information available to the Owner and an indication of its reliability are defined in other parts of the Contract Documents. See Section 01111, Site Conditions for surface and subsurface information available at or contiguous to the project site.

1.07 RULES AND REGULATIONS

A. The Building Code of the City of Bentonville, Arkansas, shall control the demolition, modification or alteration of the existing buildings or structures.

B. No building or structure, or any part thereof, shall be demolished until an application has been filed with the Building Inspector and a permit issued.

C. The Contractor is responsible for the demolition permit application. All building demolition permit fees are the Contractor’s responsibility. See Section 01170, Special Provisions, for additional permitting information.

1.08 DISPOSAL OF MATERIALS

A. Unless otherwise noted, salvageable material and equipment listed in this Specification remain the property of the Owner. Dismantle all such materials to a size that can be readily handled and deliver them to a designated storage area.

B. All other materials and items of equipment shall become the Contractor’s property and must be removed from the site.

C. The storage or sale of removed items on the site is not allowed.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 GENERAL

A. All materials and equipment removed from existing work become the property of the Contractor, except for those items that the Owner has identified and marked to retain. Carefully remove so as not to damage materials and equipment marked by the Owner to remain. Clean, store and protect on-site or at a location adjacent to the site as directed by the Owner.

B. Dispose of all demolition materials, equipment, debris and all other items not marked by the Owner to remain. Unless otherwise indicated on the Drawings, dispose of items off-site and in conformance with all existing applicable laws and regulations.

3.02 PROTECTION

A. Traffic Access

1. Conduct demolition and modification operations and the removal of equipment and debris to ensure minimum interference with roads, streets, walks, both on-site and off-site. Ensure minimum interference with occupied or used facilities.

2. Direct special attention towards maintaining safe and convenient access to existing facilities by plant personnel and plant associated vehicles.

3. Do not close or obstruct streets, walks or other occupied or used facilities without authorization from the Engineer and the governing authority. Furnish alternate routes around closed or obstructed traffic in access ways.

B. Closing or obstructing roadways, sidewalks, and passageways adjacent to the work by the placement or storage of materials will not be permitted. Conduct all operations with a minimum interference to traffic on these ways.

C. Erect and maintain barriers, lights, and other required protection devices.

D. Pollution Control

1. Use water sprinkling, temporary enclosures, or other suitable methods to limit the amount of dust and dirt to the lowest practical level. Comply with governing regulations pertaining to environmental protection.

2. Do not use water when it may create hazardous or objectionable conditions such as pollution, flooding, or ice.

3.03 BUILDING DEMOLITION

A. Dismantle existing buildings, including structural framing, roofing and siding, access doors and hatches, etc.

B. Unless otherwise approved by the Engineer, proceed with demolition from the top of the structure to the ground. Complete demolition work above each floor or tier before disturbing supporting members of lower levels.

C. Demolish concrete and masonry in small sections.

D. Remove structural framing members and lower to ground by means of hoists, cranes or other suitable methods.

E. Break up and remove foundations and slabs-on-grade, unless otherwise shown on the Drawings to remain.

F. Locate demolition equipment throughout the structure and remove material so as not to impose excessive loads to supporting walls, floors or framing.

3.04 STRUCTURAL REMOVAL

A. Remove structures to the lines and grades shown on the Drawings, unless otherwise directed by the Engineer. The removal of structural members or architectural finishes beyond these limits shall be at the Contractor's expense. Excess removals shall be reconstructed to the satisfaction of the Engineer and at no additional cost to the Owner.

B. Unless otherwise noted on the Drawings, demolish, and remove from the site all tile, reinforcement, structural or miscellaneous metals, plaster, wire mesh, and other items contained in or upon the structure. Do not use demolished items for structural or trench backfill material.

C. After removal of parts or all of masonry walls, slabs and like work that ties into new or existing work, neatly repair the junction point to leave only finished edges and surfaces exposed.

D. Unless otherwise indicated on the Drawings, demolish concrete structures to a point 24 inches below finished grade. Flood below grade tanks, vaults, etc. with sand and install an earthen cap of compacted select material.

E. For the installation of new structures or equipment, and where the Drawings do not indicate demolition limits, remove the existing structure to a point 4 inches outside the footprint of the item proposed for installation.

3.05 MECHANICAL REMOVAL

A. Mechanical removals shall consist of dismantling and removing buried and exposed piping, and other appurtenances as specified, shown on the Drawings, or required for the completion of the Work. Removals include cutting, capping, and plugging piping as required for complete removal from service. Other sections of Division 2 include specifications for cutting existing piping for the purpose of making connections.

B. Remove existing process, water and other piping not required for the new work as shown on the Drawings, or where it will interfere with new work. Unless otherwise shown on the Drawings, remove piping to the nearest solid support, cap the piping, and leave the remainder in place.

C. When underground piping is altered or removed, cap the remaining pipe and block, as necessary. Underground piping may be abandoned in place if noted on the Drawings, and if it does not interfere with new work.

D. Changes to potable water piping and other plumbing and heating system work shall conform to all applicable codes and requirements as new piping construction. Pressure test and disinfect all altered or opened portions of the potable water system in accordance with other Sections of these Specifications. Pressure test all other plumbing and heating piping.

E. Remove existing pumps, motors, equipment, and other appurtenances as shown on the Drawings, or as required for the completion of the Work.

F. Remove waste and vent piping to the points shown on the Drawings. Plug pipes and install cleanouts as necessary. Where vent stakes pass through an existing roof, remove piping, and repair the roof opening with a watertight patch.

3.06 ELECTRICAL REMOVAL

A. Remove existing transformers, distribution switchboards, control panels and panel boards, motors, conduits and wires, poles and overhead wiring, lighting fixtures and miscellaneous electrical equipment as shown on the Drawings, specified herein, or as required to perform the work. Coordinate with the electric utility for removal and proper disposal of existing pole and pad-mounted transformers. The Contractor shall provide written confirmation that the electric utility will assume the responsibility for the testing, cleanup, removal, and disposal of any polychlorinated biphenyls (PCBs) associated with electrical transformers.

B. Remove existing electrical equipment and fixtures with such care as required to prevent unnecessary damage, to keep existing systems in operation, and to maintain the integrity of the grounding systems.

C. Abandon or remove conduits and wiring where shown on the Drawings. Remove all wires in abandoned conduits, and salvage to Owner. Abandon conduits concealed in floor, ceiling slabs, or in walls by cutting flush with the slab or wall at the point of entrance. Close the conduits with a suitable plug and repair the area in a flush, smooth and approved manner. Disassemble and remove exposed conduits and their supports from the site. Repair all areas of work to prevent rust spots on exposed surfaces.

D. Where shown or otherwise required, remove wiring in underground duct systems. Salvage and store all such wiring as specified. Verify the function of all wiring before disconnection and removal. Plug ducts not scheduled for reuse where they enter buildings and make the penetrations watertight.

E. Where shown on the Drawings, abandon direct-burial cable. Disconnect such cable at both ends of the run. Where it enters a building or structure, cut the cable back to the point of entrance. Patch all opening in buildings at the entrance of abandoned direct-burial cable and make the penetrations watertight.

F. Where shown on the Drawings, abandon poles and overhead wiring. The power company will remove existing substation and power poles owned by the power company. Remove poles not owned by the power company from the site. Salvage and store the overhead wires. Perform this work after completing and energizing the proposed electric service, and in accordance with the approved schedule.

G. Where shown on the Drawings, remove or relocate lighting fixtures. Remove and dispose of fixtures not scheduled for relocation. Carefully remove relocated fixtures from their present location and rehang where shown.

H. Remove and dispose of wall switches, receptacles, starters and other miscellaneous electrical equipment as required. Exercise care in removing all equipment to minimize damage to architectural and structural members. Repair any damage incurred at no additional cost to the Owner.

3.07 REPAIR

A. Promptly repair damage caused to adjacent facilities by demolition operation when directed by the Engineer, and at no additional cost to the Owner. Repair facilities and structures at least equal to that which existed prior to the start of construction.

3.08 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site. On-site storage or sale of items removed is prohibited.

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off Owner’s property and legally dispose of them.

3.09 CLEANING

A. Remove from the site all debris resulting from the demolition operations as it accumulates and dispose of it at an approved disposal site. Upon completion of the work, all materials, equipment, waste, and debris of every sort shall be removed, and premises shall be left clean, neat, and orderly.

B. Clean adjacent structures, facilities and improvements of dust, dirt and debris caused by demolition operations. Return adjacent areas to conditions existing prior to the start of work.

END OF SECTION

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SECTION 02070

SELECTIVE DEMOLITION

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals; and demolish selective portions of work shown on the Drawings and as specified herein.

B. The work shall include selective demolition of portions of existing buildings, foundations, slabs, walls, roofs, mechanical equipment, HVAC equipment, plumbing, electrical systems, buried piping and other items encountered during construction activities.

C. Except as noted, dispose of all demolished materials and other debris off-site.

D. Coordinate demolition activities with the ongoing operations of the existing Bentonville Water Resource Recovery Facility. Exercise due concern for the existing facilities and equipment to remain in operation during construction and direct all construction and demolition activities toward maintaining continuous operation and minimizing disruptions.

1.02 MATERIALS COMPLIANCE WITH AIS

A. P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), includes an “American Iron and Steel (AIS)” requirement in section 436 that requires Clean Water State Revolving Loan Fund (CWSRF) and Drinking Water State Revolving Loan Fund (DWSRF) assistance recipients to use iron and steel products that are produced in the United States for projects for the construction, alteration, maintenance, or repair of a public water system or treatment works. This Project meets the definition of such work, and the Environment Protection Agency (EPA) implementation requirements for this AIS requirement are outlined within the DWSRF memorandum titled “Implementation of American Iron and Steel provisions of P.L. 113-76, Consolidated Appropriations Act, 2014” included as part of the RLF Supplemental General Conditions.

B. All parties are required to comply with these requirements and to ensure that all qualifying iron and steel products used in this project must be produced in the United States. See RLF Supplemental General Conditions for additional details.

1.03 RELATED SECTIONS

A. Section 01110 – Summary of Work

B. Section 01300 – Submittals

C. Section 01350 – Environmental Protection Procedures

D. Section 01562 – Dust Control

E. Section 01666 – Testing of Pipelines

F. Section 01781 – Project Record Documents

G. Section 02050 – Demolition and Modifications

H. Patching and repair of piping, structures, electrical systems, etc., are covered under other sections of these Specifications. See Division 3 – Concrete, Division 15 – Mechanical, and Division 16 – Electrical.

1.04 DEFINITIONS

A. Remove: Remove and legally dispose of items except those indicated to be reinstalled, salvaged, or to remain the Owner's property.

B. Remove and Salvage: Items indicated to be removed and salvaged remain the Owner's property. Remove, clean, and pack or crate items to protect against damage. Identify contents of containers and deliver to Owner's designated storage area.

C. Remove and Reinstall: Remove items indicated; clean, service, and otherwise prepare them for reuse; store and protect against damage. Reinstall items in the same locations or in locations indicated on the Drawings.

D. Remove and Replace: Remove and legally dispose of items and replace with new items as indicated.

E. Existing to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by the Engineer, items may be removed to a suitable, protected storage location during selective demolition, and then cleaned and reinstalled in their original locations.

1.05 MATERIALS OWNERSHIP

A. Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain the Owner's property, demolished materials become the Contractor's property. Remove demolished materials from the site with further disposition at the Contractor's option, subject to any restrictions indicated herein or in other sections of these Specifications.

B. At least 48 hours prior to commencing demolition or removal, notify the Engineer in writing of the proposed schedule. The Owner shall inspect any affected existing equipment and identify those items that are to remain the property of the Owner. No removals shall start without authorization from the Engineer.

C. Any such material damaged due to improper handling will not be accepted and the replacement value of the material deducted from the payment to the Contractor.

1.06 SUBMITTALS

A. See Section 01300, Submittals, for submittal procedures.

B. Submit a schedule of selective demolition activities indicating the following:

1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity

2. Interruption of utility services

3. Coordination for shutoff, capping, and continuation of utility services

4. Coordination of Owner's continuing occupancy of portions of existing site and of Owner's partial occupancy of completed Work

C. Submit an inventory of items to be removed and salvaged.

D. Coordinate with the Owner to prepare an inventory of items to be removed by Owner.

E. Submit photographs or videotape, sufficiently detailed, of existing conditions of adjoining construction and site improvements that might be misconstrued as damage caused by selective demolition operations.

F. Provide Record Drawings at Project closeout in accordance with Section 01781, Project Record Documents. Identify and accurately locate capped utilities and other subsurface structural, electrical, or mechanical conditions.

G. Provide copies of disposal records indicating receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1.07 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with governing EPA notification regulations before starting selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

1.08 PROJECT CONDITIONS

A. Provide not less than a 48-hour notice to the Owner prior to the commencement of demolition or removal work and notify the Engineer in writing of the proposed demolition schedule. Owner shall inspect the existing equipment and identify those items that are to remain on the Owner's property. No removals shall be started without the permission of the Engineer.

B. Owner will occupy or continue to utilize portions of the site immediately adjacent to selective demolition area. Conduct selective demolition so that Owner's operations will not be disrupted. Provide not less than a 48-hour notice to Owner of activities that will affect Owner's operations.

C. The Owner and Engineer assume no responsibility for actual condition of buildings, structures or equipment to be selectively demolished. The Owner will maintain building and site conditions existing at the time of bidding insofar as practical. However, variations within a structure or at the site may occur prior to the start of demolition work.

D. Storage or sale of removed items or materials on-site will not be permitted.

1.09 WARRANTY

A. Existing Special Warranty: Remove, replace, patch, and repair materials and surfaces that are cut or damaged during selective demolition by methods and with materials so as not to void existing warranties.

PART 2 PRODUCTS

2.01 MATERIALS

A. Use repair materials identical to existing materials.

1. Where identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.

2. Use materials whose installed performance equals or surpasses that of existing materials.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that utilities have been disconnected and capped.

B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

C. Inventory and record the condition of items to be removed and reinstalled and the condition of items to be removed and salvaged.

D. When unanticipated mechanical, electrical, or structural elements are encountered that conflict with the intended function or design, investigate and measure the nature and extent of the conflict. Promptly submit a written report to the Engineer.

E. Survey the condition of the building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of the structure or adjacent structures during selective demolition.

F. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

3.02 PREPARATION

A. Drain, purge, or otherwise remove, collect, and properly dispose of chemicals, gases, explosives, acids, flammables, or other dangerous materials before proceeding with selective demolition operations.

B. Employ a certified, licensed exterminator to treat buildings and to control rodents and vermin before and during selective demolition operations.

C. Conduct demolition operations and remove debris to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.

D. Conduct demolition operations to prevent injury to people and damage to adjacent buildings and facilities to remain. Ensure safe passage of people around selective demolition area.

1. Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction.

2. Protect existing site improvements, appurtenances, and landscaping to remain.

3. Provide temporary weather protection, during interval between demolition and removal of existing construction, on exterior surfaces and new construction to ensure that no water leakage or damage occurs to structure or interior areas.

E. Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent movement, settlement, or collapse of building to be selectively demolished.

1. Strengthen or add new supports when required during progress of selective demolition.

3.03 UTILITY SERVICES

A. Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

B. Do not interrupt existing utilities serving occupied or operating facilities, except when authorized in writing by Owner and authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and to governing authorities.

C. Provide not less than 48-hour notice to Owner if shutdown of service is required during changeover. Cooperate with the Owner to shut off utilities serving structures of the existing facilities as required by the demolition operations.

D. Be solely responsible for making all necessary arrangements and for performing any necessary work involved in connection with the discontinuance or interruption of all public and private utilities or services under the jurisdiction of the utility companies.

E. All utilities being abandoned shall be disconnected and terminated at the service mains in conformance with the requirements of the franchised utility companies or the municipality owning or controlling the utility.

F. Utility Requirements: Refer to Division 2 for cutting, plugging or relocation of existing buried piping. Refer to Division 15 and 16 for shutting off, disconnecting, removing, and sealing or capping utility services and plumbing at building, structures, etc. Do not start selective demolition work until utility disconnecting and sealing have been completed and verified in writing.

3.04 POLLUTION CONTROLS

A. Use water mist, temporary enclosures, and other suitable methods to limit the spread of dust and dirt. Contractor shall comply with all requirements in Specification Section 01562, Dust Control.

B. Comply with governing environmental protection regulations. Do not use water when it may damage existing construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution. Contractor shall comply with Section 01350, Environmental Protection Procedures

C. Remove and transport debris for disposal in a manner that will prevent spillage on adjacent surfaces and areas.

D. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before start of selective demolition.

3.05 SELECTIVE DEMOLITION

A. Demolish and remove existing construction only to the extent required by new construction and as indicated on the Drawings. Use methods required to complete Work within limitations of governing regulations and as follows:

1. Proceed with selective demolition systematically, from higher to lower level.

2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. To minimize disturbance of adjacent surfaces, use hand or small power tools designed for sawing or grinding, not hammering and chopping.

3. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.

4. Maintain adequate ventilation when using cutting torches.

5. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.

6. Locate selective demolition equipment throughout the structure and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.

7. Return elements of construction and surfaces to remain to condition existing before start of selective demolition operations.

3.06 STRUCTURAL REMOVALS

A. Demolish concrete and masonry in small sections. Cut concrete and masonry at junctures with construction to remain, using power-driven masonry saws or hand tools; do not use power-driven impact tools. Refer to Division 3 for cutting and repair of existing concrete structures.

B. Break up and remove concrete foundations and slabs on grade, unless otherwise shown to remain.

C. Remove structural framing members and lower to ground by means of hoists, derricks or other suitable methods to avoid free fall and to prevent ground impact or dust generation.

D. Unless otherwise approved by the Engineer, remove concrete, brick, tile, concrete block, roofing materials, reinforcement, structural or miscellaneous metals, plaster, wire mesh, and other items, whole or in part, as shown on the Drawings.

3.07 MECHANICAL REMOVALS

A. Dismantle and remove existing piping, pumps, motors, HVAC and plumbing equipment, and other mechanical equipment and appurtenances required for the completion of the Work, and as shown on the Drawings. Refer to Division 15 for cutting, patching, or relocation of existing mechanical items.

B. Remove air-conditioning equipment without releasing refrigerants.

3.08 ELECTRICAL REMOVALS

A. Dismantle and remove existing transformers, distribution switchboards, control panels and panel boards, motors, conduits and wires, poles and overhead wiring, lighting fixtures, and miscellaneous electrical equipment required for the completion of the Work, and as shown on the Drawings. Refer to Division 16 for cutting, patching, or relocation of existing electrical items.

3.09 PATCHING AND REPAIRS

A. Promptly patch and repair holes and damaged surfaces caused to adjacent construction by selective demolition operations.

B. Where repairs to existing surfaces are required, patch to produce surfaces suitable for new materials. Completely fill holes and depressions in existing masonry walls to remain with an approved masonry patching material, applied according to manufacturer's printed recommendations.

C. Restore exposed finishes of patched areas and extend finish restoration into adjoining construction to remain in a manner that eliminates evidence of patching and refinishing.

3.10 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site. On-site storage or sale of items removed is prohibited.

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.11 CLEANING

A. Remove from the site all debris resulting from demolition operations as it accumulates. Upon completion of the Work, remove all materials, equipment, waste and debris, leaving clean, neat and orderly premises.

B. Sweep buildings and structures broom clean upon completion of selective demolition operations.

C. Change filters on air-handling equipment upon completion of selective demolition operations.

END OF SECTION

SECTION 02100

SITE PREPARATION

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials and equipment and perform all site preparation and removal of obstructions, complete as shown on the Drawings and as specified herein.

B. Obtain permits for on-site burning of trees required for site preparation prior to proceeding with the work.

C. Areas to be cleared, grubbed, and stripped generally consist of areas within the project site where construction is proposed.

1.02 MATERIALS COMPLIANCE WITH AIS

A. P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), includes an “American Iron and Steel (AIS)” requirement in section 436 that requires Clean Water State Revolving Loan Fund (CWSRF) and Drinking Water State Revolving Loan Fund (DWSRF) assistance recipients to use iron and steel products that are produced in the United States for projects for the construction, alteration, maintenance, or repair of a public water system or treatment works. This Project meets the definition of such work, and the Environment Protection Agency (EPA) implementation requirements for this AIS requirement are outlined within the DWSRF memorandum titled “Implementation of American Iron and Steel provisions of P.L. 113-76, Consolidated Appropriations Act, 2014” included as part of the RLF Supplemental General Conditions.

B. All parties are required to comply with these requirements and to ensure that all qualifying iron and steel products used in this project must be produced in the United States. See RLF Supplemental General Conditions for additional details.

1.03 RELATED SECTIONS

A. Section 01111 – Site Conditions

B. Section 01170 – Special Provisions

C. Section 01300 – Submittals

D. Section 01350 – Environmental Protection Procedures

E. Section 01665 – Trench Safety Requirements

F. Section 02050 – Demolition and Modifications

G. Section 02070 – Selective Demolition

H. Section 02200 – Earthwork

I. Section 02370 – Erosion and Sedimentation Control

J. Section 02920 – Seeding

1.04 DEFINITIONS

A. Remove: Remove and legally dispose of items except those indicated to be reinstalled, salvaged, or to remain the Owner's property.

B. Remove and Salvage: Items indicated to be removed and salvaged remain the Owner's property. Remove, clean, and pack or crate items to protect against damage. Identify contents of containers and deliver to Owner's designated storage area.

C. Remove and Reinstall: Remove items indicated; clean, service, and otherwise prepare them for reuse; store and protect against damage. Reinstall items in the same locations or in locations indicated on the Drawings.

D. Remove and Replace: Remove and legally dispose of items and replace with new items as indicated.

E. Existing to Remain: Protect construction indicated to remain against damage. When permitted by the Engineer, remove items to a suitable, protected storage location during construction, and then clean and reinstall items in their original locations.

1.05 SUBMITTALS

A. See Section 01300, Submittals, for submittal procedures.

B. Submit copies of all required permits prior to clearing, grubbing, and stripping work.

1.06 COORDINATION

A. Completely coordinate the work of this Section with the work of other Sections. Verify at the site both the dimensions and work of other trades adjoining items of work in this section before commencement of items specified herein.

B. Furnish to the pertinent trades all items included under this Section that are to be built into the work of other Sections.

1.07 FIELD MEASUREMENTS

A. Take field measurements at the site to verify or supplement indicated dimensions and to ensure proper coordination of all other construction items.

1.08 LIMITS OF WORK

A. Unless otherwise indicated on the Drawings or in Section 01111, Site Conditions, the limits of the work under this contract shall extend to the Owner's designated property lines, right-of-way or easement lines, or high-water mark (for creek or drainage ditches).

B. The Owner will not be responsible for obtaining additional sites for the storage of equipment, the stockpiling of materials, the securing of additional material, or other lands not required by the finished construction. No separate payment will be made for acquisition or use of off-site storage areas.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 CLEARING VEGETATION

A. Cut and remove all timber, trees, stumps, brush, shrubs, roots, grass, weeds, rubbish and any other objectionable material resting on or protruding through the surface of the ground.

B. Preserve and protect trees and other vegetation designated on the Drawings or directed to remain by the Engineer to remain as specified below.

3.02 GRUBBING

A. Grub and remove all stumps, roots larger than 1-1/2 inches in diameter, root balls or mats, brush, timber, logs, concrete rubble, and other debris encountered to a depth of 18 inches below original grade.

B. Refill all grubbing holes and depressions excavated below the finished ground surface with material similar to the in-situ soil or with select material as directed by the Engineer. Compact fill material to a density conforming to the requirements of Section 02200, Earthwork.

3.03 STRIPPING

A. Strip and stockpile topsoil from all areas to be occupied by buildings, structures, sidewalks, roadways, and all areas to be excavated or filled.

B. Stockpile topsoil free from brush, trash, large stones, and other extraneous material. Avoid mixing topsoil with subsoil.

C. Protect stockpiled topsoil until it is used for site restoration or landscaping.

3.04 DISPOSAL

A. Dispose of material and debris from site preparation operations by hauling to an approved off-site disposal area. Burial of rubbish or debris is not allowed on the project site.

B. On-site disposal of cleared and grubbed materials by open air burning may be permitted on with the expressed written consent of the Owner or the local government. Burning operations and ash disposal shall be conducted in accordance with local and state burning and air quality requirements, and subject to applicable permit requirements.

3.05 PROTECTING VEGETATION

A. Protect trees and other vegetation designated on the Drawings, or as directed by the Engineer to remain from damage, from all construction operations by erecting suitable barriers, guards, enclosures or by other approved means. For trees designated for protection on the Drawings, erect and maintain temporary fencing at the drip line of each tree.

B. Conduct clearing operations in a manner to prevent falling trees from damaging trees and vegetation designated to remain, to prevent damaging the work being constructed, and to provide for the safety of employees and others.

C. Maintain protection of vegetation until all work has been completed.

D. Do not operate heavy equipment or stockpile materials within the branch spread (drip line) of existing trees.

E. Secure the services of a certified arborist or approved tree service to repair immediately any damage to existing tree crowns, trunks, or root systems.

F. When work is completed, remove all dead and downed trees. Trim all live trees of dead and diseased limbs and branches. Make all cuts cleanly at their juncture with the branch or proceeding branch without injury to the trunk or remaining branches.

G. Restrict construction activities to those areas within the limits of construction as designated on the Drawings, within public rights-of-way, and within easements provided by the Owner. Restore damage to adjacent public or private properties and improvements to their original condition and to the full satisfaction of the property owner and the Engineer.

3.06 CLEARING OTHER WORK AREA OBSTRUCTIONS

A. Clear the work area of all obstructions that will affect or will be affected by the construction of the project. Remove all items so encountered unless otherwise shown on the Drawings or otherwise directed by the Engineer. These items shall include, but not be limited to signs, culverts, headwalls, pavements, landscaping, and other items constituting an obstruction, which are encountered.

B. Remove as part of the clearing operation all structures, foundations, culverts, headwalls, concrete slabs and other obstructions or rubbish of any nature, which interfere with the proposed improvements, unless otherwise directed by the Engineer or noted on the Drawings.

3.07 PROTECTING AND REMOVING OBSTRUCTIONS

A. Take every precaution in protecting and removing obstructions that are to be replaced or reconstructed.

B. Coordinate removal and relocation of traffic and street signs with the City Street Department.

3.08 OBSTRUCTIONS NOT SHOWN ON DRAWINGS

A. The Drawings show the location of certain exposed and buried obstructions, as well as existing surface and subsurface structures. Neither the Owner nor the Engineer assumes any responsibility for failure to show obstructions or structures on the Drawings or to show them in their exact location. The absence of these obstructions on the Drawings does not relieve the Contractor of any responsibility in the protection, removal and satisfactory replacement of these obstructions. The failure to show the obstructions will not be considered sufficient basis for claims for extra work or for increasing the pay quantities in any manner whatsoever unless the obstruction encountered is such as to necessitate substantial changes in the lines and grades of the proposed improvements or requires the building of a special structure.

B. The removal or relocation of existing franchised utility mains required to permit orderly progress of the work shall be accomplished by local agencies as shown on the Drawings or specified within these specifications. Notify all utility companies, all pipeline owners, or other parties affected, and endeavor to have the necessary adjustments of the public or private utility fixtures, pipelines, pole lines, and other appurtenances within or adjacent to the limits of the construction made as soon as possible. The relocation of existing utility service lines is the responsibility of the Contractor.

C. It is understood and agreed that the Contractor has considered in his bid all the permanent and temporary utility appurtenances in their present or relocated positions as shown on the Drawings or as specified herein. No additional compensation will be allowed for any delays, inconvenience, or damage sustained by Contractor due to any interference from said utility appurtenances or the operation of moving them.

D. The Contractor shall notify the owner of the utility in the path of his operation, sufficiently in advance of his work, to enable the utility owner to have a representative present during construction activities.

3.09 WATERWAYS

A. Existing natural and artificial waterways shall be left open to flow freely. Provide temporary dams or bypasses as necessary and/or as directed by the Engineer. Provide erosion control features in conformance with the Storm Water Pollution Prevention Plan and the requirements of Section 02370, Erosion and Sedimentation Control.

3.10 REMOVING CULVERTS

A. Do not remove culverts or other drainage structures until making satisfactory arrangements to accommodate traffic.

3.11 REMOVAL OF PAVEMENTS AND SIDEWALKS

A. Remove all pavements, driveways, sidewalks, curbs and other such items indicated in the Drawings in a workmanlike manner. Restrict the area of each removed item to the minimum possible area that will still conform to the lines and grades of the completed construction.

B. Saw cut asphalt and concrete surfaces at the boundaries of the areas to be removed. Saw reasonably true to line and to a depth so that undue under-breakage or shattering of the adjacent surfaces will not occur when removing the material. The equipment for sawing shall be approved mechanical concrete saws in satisfactory working condition and adequately powered to cut the depth required.

3.12 FENCE REMOVAL AND REPLACEMENT

A. Relocate fence designated for replacement in advance of other construction. If designated on the Drawings, provide temporary fencing clear of the proposed construction. Store materials not required for the temporary fence. Replace all damaged fence materials at no additional cost to the Owner.

B. Unless directed by the Engineer, secure areas enclosed by fences at all times that the fences are removed, or the areas are otherwise accessible to the public.

3.13 PROTECTION OF PROPERTY

A. Preserve all public and private property encountered in the construction of these improvements.

B. The Contractor shall be responsible for all damage or injury to the property of any character, during the prosecution of the work, resulting from any act, omission, neglect or misconduct in his manner or methods of executing the work, or at any time due to defective work or materials, and said responsibility will not be released until the project has been completed and accepted.

C. When or where any direct or indirect damage or injury is done to public or private property by or because of any act, omission, neglect, or misconduct in the execution of the Work, or in consequence of the non-execution thereof, Contractor shall restore such damage at no additional cost to the Owner. Restore property to its existing or better condition by repairing, rebuilding, or otherwise restoring as directed by the Engineer, or make good such damage or injury in an acceptable manner.

3.14 EXPLOSIVES

A. Explosives are prohibited.

3.15 TRENCH SAFETY

A. The current edition of Occupational Safety and Health Administration Standard for Excavation and Trench Safety Systems, 29 CFR 1926, Subpart P, is specifically incorporated and made a part of these specifications and contract documents as required by Arkansas Code Annotated 22-9-212. Refer to Specification Section 01665, Trench Safety Requirements for additional trench safety requirements.

3.16 SITE MAINTENANCE

A. Maintain all disturbed areas of the site during construction. Maintenance shall include periodic mowing of areas within and adjacent to the following: security and construction fencing, silt fencing and other erosion control devices, and equipment and material storage areas.

END OF SECTION

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SECTION 02140

DEWATERING AND DRAINAGE

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Obtain and pay for all permits required for temporary dewatering and drainage. Display and maintain original permits in a prominent location at the site prior to construction of the drainage system.

B. Furnish the services of a Licensed Professional Engineer, registered in the State in which the project is located, to prepare dewatering and drainage system designs and submittals.

C. Furnish, install, operate, monitor, maintain and remove temporary dewatering and drainage systems as necessary to lower and maintain groundwater levels below subgrades of excavation to permit construction in-the-dry. Prevent surface water runoff from entering or accumulating in excavation.

D. Collect and properly dispose of all discharge water from dewatering and drainage systems in accordance with local and State requirements, permits, and any special provisions of Section 01170, Special Provisions. All dewatering and drainage systems must be piped through a sedimentation basin prior to discharge to a receiving stream or drainage structure.

E. Repair damage caused by dewatering and drainage system operations.

F. Remove temporary dewatering and drainage systems when no longer needed. Restore all disturbed areas.

1.02 MATERIALS COMPLIANCE WITH AIS

A. P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), includes an “American Iron and Steel (AIS)” requirement in section 436 that requires Clean Water State Revolving Loan Fund (CWSRF) and Drinking Water State Revolving Loan Fund (DWSRF) assistance recipients to use iron and steel products that are produced in the United States for projects for the construction, alteration, maintenance, or repair of a public water system or treatment works. This Project meets the definition of such work, and the Environment Protection Agency (EPA) implementation requirements for this AIS requirement are outlined within the DWSRF memorandum titled “Implementation of American Iron and Steel provisions of P.L. 113-76, Consolidated Appropriations Act, 2014” included as part of the RLF Supplemental General Conditions.

B. All parties are required to comply with these requirements and to ensure that all qualifying iron and steel products used in this project must be produced in the United States. See RLF Supplemental General Conditions for additional details.

1.03 RELATED SECTIONS

A. Section 01110 – Summary of Work

B. Section 01170 – Special Provisions

C. Section 01300 – Submittals

D. Section 01350 – Environmental Protection Procedures

E. Section 02100 – Site Preparation

F. Section 02370 – Erosion and Sedimentation Control

G. Section 02315 – Excavation, Trenching and Backfilling

H. Section 02316 – Structural Excavation, Backfilling and Grading

I. Section 02920 – Seeding

1.04 DEFINITIONS

A. Where the phrase "in-the-dry" is used in these specifications, it shall be defined as in situ soil moisture content of no more than two percentage points (2%) above the optimum moisture content for that soil.

1.05 SUBMITTALS

A. Submit in accordance with Section 01300, Submittals, all temporary dewatering and drainage system designs. Dewatering and drainage system designs shall be prepared by a Licensed Professional Engineer, registered in the State in which the Work is located, having a minimum of five (5) years of professional experience in the design and construction of dewatering and drainage systems. Submittal will be for information purposes only. Contractor shall retain responsibility for adequacy and safety of construction means, methods and techniques.

B. In accordance with Section 01300, Submittals, submit copies of all required permits prior to installing and operating dewatering and drainage systems.

1.06 DESIGN AND PERFORMANCE RESPONSIBILITY

A. The Contractor is responsible for the design and execution of methods for controlling surface water and groundwater.

B. The Contractor is responsible for repairing damage to properties, buildings or structures, sewers and other utility installations, pavements, and work that may result from dewatering or surface water control operations.

C. Design review and field monitoring activities by the Owner or the Engineer shall not relieve the Contractor of responsibility for the work.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 GENERAL

A. Control surface water and groundwater such that excavation to final grade is made in-the-dry and bearing soils are maintained undisturbed. Prevent softening, or instability of, or disturbance to, the subgrade due to water seepage.

B. Provide protection against flotation for all work.

C. Consider the impact of anticipated subsurface soil/water conditions when selecting methods of excavation and temporary dewatering and drainage systems. Where groundwater levels are above the proposed bottoms of excavations, a pumped dewatering system is expected for predrainage of the soils prior to excavation to final grade and for maintenance of the lowered groundwater level until construction has been completed to such an extent that the foundation, structure, pipe, conduit, or fill will not be floated or otherwise damaged. Type of dewatering system, spacing of dewatering units, and other details of the work are expected to vary with soil/water conditions at a particular location.

D. At least two (2) weeks prior to the start of construction in any areas of anticipated dewatering, submit to the Engineer for review a proposed plan for removal of water, a method(s) of excavation, and a method(s) of excavation support. Do not proceed with construction in any of these areas until the initial plan has been reviewed and commented upon by the Engineer. It is expected that the initial plan may require modification to suit any variable soil/water conditions encountered on the construction site.

3.02 SURFACE WATER CONTROL

A. Control surface water runoff to prevent flow into excavations. Provide temporary measures such as dikes, ditches, and sumps.

B. Collect precipitation or surface runoff in shallow ditches around the perimeter of the excavation, drain to sump, and pump from the excavation to maintain in-the-dry conditions.

3.03 EXCAVATION DEWATERING

A. Provide and maintain adequate equipment and facilities to remove promptly and dispose of properly all water entering excavations. Keep excavations in-the-dry, so as to maintain all undisturbed subgrade conditions throughout construction below grade, including backfill and fill placement.

B. Do not install pipe and conduit in water or allow it to be submerged prior to backfilling. Remove pipe and conduit that becomes submerged. Dewater and restore the excavation to proper conditions prior to reinstalling the pipe and conduit.

C. Maintain excavation for foundations and structures in-the-dry for a minimum of four (4) days after concrete placement. Do not allow water to enter an excavation and rise to cause unbalanced pressure on foundations and structures until the concrete or mortar has set at least 24 hours.

D. Conduct dewatering and drainage operations in such a manner as to preserve the natural undisturbed bearing capacity of the subgrade at the bottom of the excavation. If the subgrade becomes disturbed for any reason, remove the unsuitable subgrade material, and replace it with concrete, compacted granular fill, or other approved material to restore the bearing capacity of the subgrade to its original undisturbed condition.

3.04 WELL POINT SYSTEM

A. As part of the dewatering system, a vacuum wellpoint system may be required around the excavation to dewater granular soils. Each wellpoint and riser pipe shall be surrounded by a sand filter. Sand shall be of such a gradation that, after initial development of wellpoints, the quantity and size of soil particles discharged shall be negligible. The wellpoint system shall be capable of operating continuously under the highest possible vacuum.

B. The installation of the well point system shall be done under the supervision of a qualified representative of the wellpoint equipment supplier.

3.05 DISPOSAL OF DRAINAGE

A. All water discharged from temporary dewatering and drainage systems shall be disposed of in accordance with the erosion and sedimentation control plans as specified in Section 02370, Erosion and Sedimentation Control. Existing or new sanitary sewer systems shall not be used to dispose of drainage unless the written permission of the utility or Owner is obtained.

B. Dispose of drainage to prevent flow or seepage back into excavated areas or the adjacent public water supply. Disposal area shall be approved by the Engineer, and all dewatering and drainage systems must be piped through a sedimentation basin prior to discharge.

3.06 WELL MONITORING OBSERVATIONS

A. Ground water monitoring wells have been established at the Borings B5 and B15 (see civil sheets for location). A list of ground water elevation levels at each bore site is available from the Engineer upon request.

END OF SECTION

SECTION 02200

EARTHWORK

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment, and incidentals required to perform all excavation work, hauling, grading, placement, and compaction of fill and backfill. Work shall include the disposal of unsuitable waste and surplus earthen materials, and placement of topsoil.

B. Perform all work within the limits necessary for the construction of the improvements and in conformance with the lines, grades, thicknesses, and typical cross sections shown on the Drawings and as specified herein.

1.02 MATERIALS COMPLIANCE WITH AIS

A. P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), includes an “American Iron and Steel (AIS)” requirement in section 436 that requires Clean Water State Revolving Loan Fund (CWSRF) and Drinking Water State Revolving Loan Fund (DWSRF) assistance recipients to use iron and steel products that are produced in the United States for projects for the construction, alteration, maintenance, or repair of a public water system or treatment works. This Project meets the definition of such work, and the Environment Protection Agency (EPA) implementation requirements for this AIS requirement are outlined within the DWSRF memorandum titled “Implementation of American Iron and Steel provisions of P.L. 113-76, Consolidated Appropriations Act, 2014” included as part of the RLF Supplemental General Conditions.

B. All parties are required to comply with these requirements and to ensure that all qualifying iron and steel products used in this project must be produced in the United States. See RLF Supplemental General Conditions for additional details.

1.03 RELATED SECTIONS

A. Section 01111 – Site Conditions

B. Section 01300 - Submittals

C. Section 01450 – Field Quality Control

D. Section 02100 – Site Preparation

E. Section 02140 – Dewatering and Drainage

F. Section 02315 – Excavation, Trenching and Backfilling

G. Section 02316 – Structural Excavation, Backfilling and Grading

H. Section 02370 – Erosion and Sedimentation Control

I. Section 02375 – Riprap

J. Section 02920 – Seeding

K. Section 02921 – Sodding

1.04 REFERENCE STANDARDS

A. American Association of State Highway and Transportation Officials (AASHTO), latest edition:

1. AASHTO M 57 Standard Specifications for Materials for Embankments and Subgrades

2. AASHTO M 145 Standard Specification for Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes

3. AASHTO M 146 Standard Specification for Terms Relating to Subgrade, Soil-Aggregate, and Fill Materials

4. AASHTO M 288 Standard Specification for Geotextile Specification for Highway Applications

5. AASHTO T 99 Standard Method of Test for Moisture-Density Relations of Soils Using a 2.5-kg (5.5-lb) Rammer and a 305-mm (12-in.) Drop

6. AASHTO T 180 Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop

7. AASHTO T 310 Standard Specification for In-Place Density and Moisture Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

B. ASTM International (ASTM), latest edition:

1. ASTM C33 Standard Specification for Concrete Aggregates

2. ASTM D698 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3 (600 kN-m/m^3))

3. ASTM D1557 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3 (2,700 kN-m/m^3))

4. ASTM D2487 Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)

5. ASTM D4318 Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

6. ASTM D4355 Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture, and Heat in a Xenon Arch-Type Apparatus

7. ASTM D4491 Standard Test Methods for Water Permeability of Geotextiles by Permittivity

8. ASTM D4533 Standard Test Method for Trapezoid Tearing Strength Geotextiles

9. ASTM D4595 Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Method

10. ASTM D4632 Standard Test Method for Grab Breaking Load and Elongation of Geotextiles

11. ASTM D4751 Standard Test Methods for Determining Apparent Opening Size of a Geotextiles

12. ASTM D5084 Standard Test Methods for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

13. ASTM D6241 Standard Test Method for Measuring Static Puncture Strength of Geotextiles and Geosynthetic-Related Products Using a 50mm Probe

14. ASTM D6938 Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

C. Arkansas Department of Transportation (ARDOT):

1. Standard Specifications for Highway Construction, current edition

D. Occupational Safety and Health Administration (OSHA), latest edition:

1. All excavations and support systems shall conform to applicable OSHA excavation, trenching, and shoring standards that are contained in the U.S. Code of Federal Regulations 29 CFR 1926.650-1926.653, and other federal, state, or local requirements. In the event of a conflict, comply with the more restrictive applicable requirements.

2. The current edition of Occupational Safety and Health Administration Standard for Excavation and Trench Safety Systems, 29 CFR 1926, Subpart P, is specifically incorporated and made a part of these specifications and contract documents as required by Arkansas Code Annotated 22-9-212.

1.05 DEFINITIONS

A. Boulder Excavation: The removal of boulders or boulder pieces larger than 1 cubic yard (1 CY) in volume that requires equipment for splitting and breaking methods, or that requires increasing a trench or excavated area more than 18 inches.

B. Common Excavation: The removal of all material not classified as boulder, concrete, or rock excavation. Classify as Common Excavation any piece of boulder or concrete 1 cubic yard (1 CY) or less in volume that can be mechanically removed without drilling and blasting, breaking, splitting, or increasing the trench or excavated area as specified.

C. Concrete Excavation: The removal of concrete pieces larger than 1 cubic yard (1 CY) in volume that requires equipment for splitting and breaking methods, or that requires increasing a trench or excavated area more than 18 inches. Concrete excavation includes materials composed of Portland cement that are not identified in other sections of the Specifications and excluding manholes, drainage structures, vaults, piping or other appurtenances that are typically classified as Common Excavation.

D. Exploratory Excavation: The removal and replacement of materials from locations shown on the Drawings, as directed by the Engineer, or for the Contractor's benefit for the purpose of investigating underground conditions and to identify potential utility conflicts between existing and proposed facilities. Unless otherwise indicated in the Bid Proposal, the Owner will not make separate payment for exploratory excavation.

E. Rock Excavation: Sedimentary rock which, by demonstration, cannot be excavated with equipment weighing at least 50,000 pounds and having at least 140 net horsepower (140 HP), equipped with a ripper or similar approved equipment without prior systematic drilling and blasting or breaking with power-operated rock excavation tools. The Engineer may waive the demonstration if the material encountered is well-defined rock.

F. Trench Excavation: The removal of materials encountered in trenches to the depths as shown on the Drawings or as directed by the Engineer. See Section 02315, Excavation, Trenching and Backfilling.

G. Undercut Excavation: The removal and disposal of undesirable material and replacement with select material or other approved backfill below finished subgrade or below existing grade in areas of proposed embankment. Undesirable material shall include deposits of saturated or unsaturated mixtures of soils and organic matter not suitable for subgrade or foundation material. The Engineer shall determine the need and extent of Undercut Excavation and may designate as unsuitable those soils that cannot be stabilized in place through normal drying and compactive efforts when satisfactory weather and ground conditions exist.

H. Where the phrase "in-the-dry" is used in these Specifications, it shall be defined to mean a soil condition where the in-place moisture content is no more than two percent (2%) above the optimum moisture content of that soil. The optimum moisture content shall be as determined by the laboratory test of the moisture-density relation appropriate to the specified level of compaction, unless otherwise recommended in the geotechnical report. See also Section 02140, Dewatering and Drainage.

I. Where used in this Specification "structures" refers to all buildings, wet wells, manholes and below-grade vaults. Stormwater structures and duct banks are not considered "structures" in this context.

1.06 SUBMITTALS

A. See Section 01300, Submittals, for submittal procedures.

B. Submit the proposed methods of construction, including excavation, backfilling, and compaction for the various portions of the work.

C. Submit an excavation and trench safety plan to the Engineer for review for excavations greater than or equal to 5 feet deep.

D. Furnish test data to indicate compliance of all earthwork materials, placement, and compaction methods with this specification, including off-site material proposed for the Project.

1.07 QUALITY ASSURANCE

A. Responsibilities for providing the quality control and quality assurance testing activities are defined in Section 01450, Field Quality Control. Testing frequencies are defined under the paragraph on Field Testing at the end of this Section.

B. Furnish manufacturer or supplier certification for all products and materials from off-site sources for approval by the Engineer. Materials shall include but not be limited to select material, clay, rock, crushed stone, and topsoil. Provide initial material certifications at no additional cost to the Owner.

1.08 COORDINATION

A. Coordinate the work of this Section with the work of other sections. Verify at the site both the dimensions and work of other trades adjoining items of work in this Section before commencement of items herein specified.

B. Furnish to the pertinent trades all items included under this Section that are to be built into the work of other sections.

1.09 FIELD MEASUREMENTS

A. Take field measurements at the site to verify or supplement indicated dimensions and to ensure proper coordination of all other construction items.

1.10 PROJECT SITE REQUIREMENTS

A. Subsurface Conditions

1. The availability and reliability of geotechnical and other subsurface information known to the Owner is defined in Specification Section 01111, Site Conditions. Do not assume that materials other than those disclosed by soil borings or test pits will not be encountered, or that the proportions or character of the various materials will not vary from those indicated in the geotechnical investigation report. Any conclusions drawn by the Contractor from known reports, including the character of the materials to be encountered and degree of difficulty to be expected in the performance of the Work, are the sole responsibility of the Contractor.

2. The Contractor is encouraged to perform an independent subsurface investigation. Coordinate access to the site with the Owner.

3. No claim for extra compensation or extension of time will be considered because of any variation in site, soil, or water conditions described in the geotechnical reports to that encountered.

PART 2 PRODUCTS

2.01 COMMON FILL

A. Common Fill: Soil material substantially free of organic materials, topsoil, wood, peat, loam, trash, or other objectionable materials that may be compressible through decomposition or that may not be properly compacted. Common fill shall not contain rocks or stones larger than 3 inches in the largest diameter and shall have a maximum of 75% passing the No. 40 sieve and a maximum of 20% passing the No. 200 sieve. Common fill shall have a maximum liquid limit of 40 and a maximum plasticity index (PI) of 18 (per ASTM D4318).

B. Common fill shall not contain granite blocks, broken concrete, masonry rubble or other similar materials. It shall have physical properties such that it can be readily spread and compacted during filling. Snow, ice, and frozen soil are not permitted. Subject to the Engineer's approval, native material (excluding sandy, lean clay) conforming to these requirements may be used as common fill.

2.02 SELECT BACKFILL

A. Select Backfill: Select backfill must be free of sod, stumps, logs, roots, or other perishable or deleterious matter. It shall be a granular material with a maximum particle size of 3 inches, well graded from coarse to fine. The select material shall conform to AASHTO classification A-1, A-2-4 or A-2-5, or with the Engineer's approval, a sandy or gravely clay conforming to classification A-2-6 or A-6. The following additional restrictions apply:

1. Select backfill material classified as AASHTO A-2-6 may be submitted for review and evaluation by the Engineer provided that it has a plasticity index not exceeding 18.

2. Select backfill material classified as AASHTO A-6 may be submitted for review and evaluation by the Engineer provided that it has a plasticity index less than 18.

3. Evaluation of A-2-6 or A-6 material shall not imply any obligation of the Engineer to accept it for use in the Work.

4. Crusher screenings, including nepheline syenite granite fines (Donna Fill®) will not be allowed as select fill or backfill material.

5. The Contractor shall furnish certified test results to indicate compliance of select material from off-site stockpiles with this specification at no additional cost to the Owner.

6. Select backfill with more than 30 percent (30%) retained on a No. 4 sieve may be tested in accordance with ASTM D1557.

2.03 CRUSHED AGGREGATE (COARSE DRAIN FILL)

A. Coarse Drain Fill: Crushed aggregate shall be well graded, hard, durable, angular or subangular particles ranging from 3/4-inch maximum diameter to the No. 4 sieve. Unless otherwise approved by the Engineer, the material shall meet the requirements of ASTM C33, Gradation 67 for coarse aggregate.

2.04 OVERSIZED ROCK

A. Oversized rock: Stone for oversized rock shall be hard, durable, crushed stone aggregate, as manufactured by local quarries, meeting the requirements of ARDOT Standard Specifications Section 207 Stone Backfill. Stone shall range from 1½-inch to 6-inch maximum. It shall not contain more than 5-percent (5%) by weight of shale, slate, or other deleterious matter. The stone shall be uniformly graded, and the amount passing the 1½-inch sieve shall not be more than ten percent (10%) by weight. When backfilling with oversized rock to subgrade elevation, the top 4 to 6 inches shall be ASTM C33 #67 coarse aggregate or Class 7 aggregate base in accordance with ARDOT Standard Specifications.

2.05 GEOTEXTILE FABRIC FOR SOILS

A. Geotextile fabric shall be woven or non-woven synthetic fiber fabric conforming to one (1) of the following applications as indicated in the Drawings:

1. Subsurface Drainage, Class 2: Geotextile shall be used by placing against a soil to allow for long-term passage of water into a subsurface drain system that retains the in-situ soil or encapsulates bedding and backfill for buried utility piping. Geotextile fabric shall be a non-woven polypropylene fabric meeting the requirements of AASHTO M 288, Class 2 and the properties in Table 1 below. Geotextile fabric shall be TenCate Mirafi 160N or approved equal.

Table 1
Geotextile Fabric for Soil – Subsurface Drainage

Fabric Properties	**ASTM Test Method**	**Unit**	**Min. Average Roll Value**	
			MD	**CD**
Grab Tensile Strength	D4632	lb	160	160
Grab Tensile Elongation	D4632	%	50	50
Trapezoid Tear Strength	D4533	lb	60	60
CBR Puncture Strength	D6241	lb	410	
Apparent Opening Size (AOS)*	D4751	U.S. Sieve	70	
Permittivity	D4491	sec^{-1}	1.5	
Flow Rate	D4491	$gal/min/ft^2$	110	
UV Resistance (at 500 hours)	D4355	% strength retained	70	

*ASTM D4751, AOS is a maximum opening diameter value

2. Separation, Class 3: Geotextile shall be used to prevent mixing of subgrade soil and an aggregate cover material (subbase, base, select material, etc.), and beneath pavements where separation of two (2) dissimilar materials is required but water seepage through the geotextile is not a critical function. Geotextile fabric shall be a woven polypropylene fabric meeting the requirements of AASHTO M 288, Class 3 and the properties in Table 2 below. Geotextile fabric shall be TenCate Mirafi 500X or approved equal.

Table 2
Geotextile Fabric for Soil – Separation

Fabric Properties	ASTM Test Method	Unit	Min. Average Roll Value	
			MD	CD
Grab Tensile Strength	D4632	lb	200	200
Grab Tensile Elongation	D4632	%	15	15
Trapezoid Tear Strength	D4533	lb	75	75
CBR Puncture Strength	D6241	lb	700	
Apparent Opening Size (AOS)*	D4751	U.S. Sieve	40	
Permittivity	D4491	sec^{-1}	0.05	
Flow Rate	D4491	$gal/min/ft^2$	4	
UV Resistance (at 500 hours)	D4355	% strength retained	70	

*ASTM D4751, AOS is a maximum opening diameter value

3. Stabilization, Class 1: Geotextile shall be used in wet, saturated conditions to provide the coincident functions of separation and filtration. Geotextile fabric shall be a non-woven polypropylene fabric meeting the requirements of AASHTO M 288, Class 1 and the properties in Table 3 below. Geotextile fabric shall be TenCate Mirafi 160N or approved equal.

Table 3
Geotextile Fabric for Soil – Stabilization

Fabric Properties	ASTM Test Method	Unit	Min. Average Roll Value	
			MD	CD
Grab Tensile Strength	D4632	lb	160	160
Grab Tensile Elongation	D4632	%	50	50
Trapezoid Tear Strength	D4533	lb	60	60
CBR Puncture Strength	D6241	lb	410	
Apparent Opening Size (AOS)*	D4751	U.S. Sieve	70	
Permittivity	D4491	sec^{-1}	1.5	
Flow Rate	D4491	$gal/min/ft^2$	110	
UV Resistance (at 500 hours)	D4355	% strength retained	70	

*ASTM D4751, AOS is a maximum opening diameter value

4. Enhanced Stabilization, Class 1A: Geotextile shall be used in wet and otherwise poor subgrade conditions requiring enhanced separation of materials, filtration, and greater load distribution for structures. Geotextile fabric shall be a woven polypropylene fabric meeting the requirements of AASHTO M 288, Class 1A and the properties in Table 4 below. Geotextile fabric shall be TenCate Mirafi HP270 or approved equal.

Table 4
Geotextile Fabric for Soil – Enhanced Stabilization

Fabric Properties	ASTM Test Method	Unit	Min. Average Roll Value	
			MD	CD
Tensile Strength (at ultimate)	D4595	lb	2640	2460
Tensile Strength (at 5% strain)	D4595	%	1272	1440
CBR Puncture Strength	D6241	lb	410	
Apparent Opening Size (AOS)*	D4751	U.S. Sieve	30	
Flow Rate	D4491	gal/min/ft^2	40	
Permittivity	D4491	sec^{-1}	0.6	
UV Resistance (at 500 hours)	D4355	% strength retained	80	

*ASTM D4751, AOS is a maximum opening diameter value

B. Staples for installing filter fabric shall be made of wire, 0.091-inch in diameter or greater, U-shaped, with 6-inch legs and a 1-inch crown.

2.06 IMPERMEABLE FILL (CLAY)

A. Impermeable Fill: Clay material from an on-site or off-site source, tested to ensure a permeability coefficient less than or equal to 1 x 10^{-7} cm/sec after compaction, and accepted by the Engineer. The material shall conform to one of the following under the United Soil Classification System in ASTM D2487: CL or CH. The Contractor shall furnish certified test results to indicate the maximum dry density of material from off-site sources at no additional cost to the Owner.

2.07 RIPRAP

A. See Section 02375, Riprap.

2.08 TOPSOIL

A. See Section 02920, Seeding, or Section 02921, Sodding.

PART 3 EXECUTION

3.01 GENERAL

A. Earthwork shall consist of all excavation, embankment, dressing, shaping, and finishing necessary for the construction, compaction and completion of all subgrades and other earthwork indicated on the Drawings to the required alignment, grade and typical cross section as shown on the Drawings or as directed by the Engineer.

B. Do not excavate below grade except where rock is encountered or where the Engineer directs the removal of unstable material. If through negligence or other fault, excavation extends below the designated lines, replace the over-excavated material with approved backfill materials, in an approved manner and condition, and at the Contractor's expense. The Engineer shall have authority to reject or modify excavation operations; have authority over moving, placing, and disposition of all material; and shall determine the suitability of material to be placed in embankments.

C. The Contractor is responsible for determining the character, quantity, and distribution of all material to be excavated.

D. Always perform excavation work in a manner to control surface and subsurface drainage. When directed by the Engineer, install temporary drains and drainage ditches to intercept or divert surface water that may affect the Work. Suspend earthwork operations at any time when satisfactory results cannot be obtained because of rain, freezing weather, or other unsatisfactory conditions.

E. Material determined by the Engineer to be unsatisfactory for subgrade construction shall be classified as undercut excavation and shall be removed as directed by the Engineer. Backfill undercut areas with select backfill from off-site borrow areas unless otherwise directed by the Engineer. Dispose of all unsuitable material removed from undercut areas off-site.

F. Excavate all rock or unyielding material that cannot be shaped to conform to the subgrade elevations to a minimum depth of 6 inches below the deepest subgrade level of excavation. Fill the excavation to grade with approved material.

G. Use only suitable excavated material in the formation of embankments and backfills unless otherwise specified. Place the excavated material in areas of the embankment as directed by the Engineer. Remove muck, peat, matted roots, or other unsatisfactory material for subgrade foundation to the depth directed by the Engineer. Dispose of all unsuitable material off-site.

H. Do not commence construction of embankments or backfilling until the area has been inspected and approved by the Engineer. Clear and grub fill areas to remove all vegetation and objectionable material. Remove all topsoil prior to the commencement of filling. Backfill all depressions or holes beneath the ground surface, whether caused by grubbing or other reasons with suitable material and compacted before commencing construction of the subgrade. Scarify areas to be filled to a depth of 9 inches prior to placement of embankment fill. Construct fill to the specified grade in uniform layers parallel and benched into the existing soil surface and not more than 8 inches in thickness, loose measurement. The material in the layers shall be of the proper moisture

content before compacting. Wetting or drying of the material and manipulation when necessary to secure a uniform moisture content throughout the layer shall be required.

I. Accomplish backfilling of trenches for storm drainage facilities, water line improvements, sanitary sewer improvements, and other utility relocations as specified in other sections of these specifications. Compact backfill to the specified density.

3.02 PREPARATION

A. Exploratory Excavation

1. Perform exploratory excavation work for the purpose of verifying the location of underground utilities and structures and to check for unknown utilities and structures, prior to commencing excavation work.

2. Backfill exploratory excavations as soon as the desired information has been obtained. Stabilize backfilled surfaces in accordance with approved erosion and sedimentation control plans.

3.03 SOIL COMPACTION

A. In the preparation of subgrades and earthwork, compact the material to provide a stable, uniform surface. Compact the subgrade to the required density and stability and show no evidence of displacement or rutting. Provide proof rolling to evaluate the stability of the subgrade and as directed by the Engineer. Accomplish proof rolling with a loaded dump truck with a minimum weight of 10,000 pounds per axle.

B. Compact earthen material in open areas by any of the following methods: compaction equipment, fully loaded ten-wheel trucks, tractor dozers weighing at least 30,000 pounds, or heavy vibratory rollers. In confined areas (including areas within a 45-degree angle extending upward and outward from the base of a wall) and in areas where the use of large equipment is impractical, accomplish compaction by hand-operated vibratory equipment or mechanical tampers. Lift thickness shall not exceed 6 inches (measured before compaction) when hand-operated equipment is used.

C. Within 10 feet of structures: Compact the top 12 inches of existing subgrade and each layer of fill or backfill to a minimum of 95% standard proctor (ASTM D698) at or near its optimum moisture content. See also Section 02316, Structural Excavation, Backfilling and Grading.

D. Embankments (except under roadways), lawn and unimproved areas: Compact the top 6 inches of existing subgrade and each layer of fill or backfill to a minimum of 95% standard proctor (ASTM D698) at or near its optimum moisture content.

E. Beneath building slabs and slabs on grade (except sidewalks): Compact the top 12 inches of existing subgrade (and each layer of fill if applicable) to a minimum of 95% standard proctor (ASTM D698) at or near its optimum moisture content. See also Section 02316, Structural Excavation, Backfilling and Grading.

F. Sidewalks: Compact the top 6 inches of existing subgrade (and each 6-inch layer of fill if applicable) to a minimum of 95% standard proctor (ASTM D698) at or near its optimum moisture content.

G. Roads, paved areas, and roadway embankments: Compact the top 12 inches of existing subgrade and select fill beneath the pavement section to a minimum density of 95% standard proctor (ASTM D698) at or near its optimum moisture content. Compact all other soils to a minimum density of 95% standard proctor.

H. Trenches: See Section 02315, Excavation, Trenching and Backfilling.

I. The moisture content of the material being compacted shall be within a range of 2% below the optimum to a maximum of two percent (2%) above. Adjust the moisture content of the material to maintain the range specified by the addition of water or by aeration.

3.04 SUBGRADES

A. Construct the completed subgrade surface to the lines, grades and cross sections shown on the Drawings or as directed by the Engineer. Correct any irregularities or depressions that develop by loosening and recompacting the material until the surface is smooth and uniform. Provide proof rolling to evaluate the stability of the subgrade and as directed by the Engineer. Should the subgrade be rutted prior to the next phase of construction, reshape and recompact the subgrade without additional compensation to the Contractor.

B. Shaping and compacting of subgrades prior to construction of pavements shall be as specified in other sections of these specifications.

3.05 ROCK AND BOULDER EXCAVATION

A. Excavate and remove rock and boulders to the widths and depths directed by the Engineer. Where the Bid Proposal includes a separate payment for rock and/or boulder removal, excavate and remove overburden and expose the rock to allow the Engineer to measure the rock prior to removal.

B. Do not use explosives for rock or boulder excavation.

C. Dispose of all excavated rock and boulders off-site or at a designated location on-site as directed by the Engineer.

3.06 GENERAL FILLING AND BACKFILLING PROCEDURES

A. Place fill and backfill materials in lifts to suit the specified compaction requirements to the lines and grades required, making allowances for settlement and placement of cover materials (i.e., topsoil, sod, etc.). Correct soft spots or uncompacted areas by reworking.

B. Do not place fill or backfill material on frozen surfaces, or on surfaces covered by snow or ice. Fill and backfill material shall be free of snow, ice, and frozen earth.

C. Compact each layer of fill to a mass density not less than the minimum density specified. The moisture content of compacted backfill shall be within two percent (2%) (+/-) of the optimum moisture content.

D. Compact fill placed adjacent to structures by means of manually directed power tampers or plate vibrators. Unless otherwise specified or approved by the Engineer, do not operate heavy equipment including backhoe mounted power tampers, vibrating compactors, or manually directed vibratory rollers within 2 feet of any structure. Do not operate towed or self-propelled vibrating rollers (with 4 to 6-foot diameter drums) within 10 feet of any structure. Compaction by means of drop weights operating from a crane or hoist will not be permitted. Maximum layer thickness of fill lift for hand compactors or manually directed power tampers shall not exceed 6 inches.

E. When included in the Project Specifications, the more stringent requirements of Section 02316, Structural Excavation, Backfilling and Grading, for backfilling procedures and compaction limits shall take precedence over the requirements indicated in the previous paragraph.

3.07 FILL AND BACKFILL PROCEDURES

A. Fill and backfill material placed immediately adjacent to and within 10 feet of all structures shall be select fill. Complete all watertightness tests and damp proofing and/or waterproofing prior to placing fill or backfill around structures. Backfill may be placed prior to testing with the approval of the Engineer. Place and compact select fill in even lifts of 6 inches (compacted thickness) uniformly around the structure.

B. Common fill may be used in areas beyond those designated for select fill unless shown or specified otherwise. Place and compact common fill in even lifts having a maximum thickness (measured before compaction) of 12 inches.

C. Fill required beneath building slabs or slabs on grade (except sidewalks) shall be select material or as shown on the Drawings. Place and compact select material in even lifts of 6 inches (compacted thickness) as specified on the plans. On-site material considered for use as select fill beneath building slabs may be submitted to the Engineer for review but shall not imply any obligation of the Engineer to accept it for use in the Work.

3.08 EMBANKMENT FILL PROCEDURES

A. Prior to placing embankment fill materials, remove all organic materials (including peat and loam) and loose inorganic silt material (loess) from areas beneath proposed embankments. If the subgrade slopes are excessive, construct steps in the subgrade to produce a stable, horizontal surface for the placement of embankment materials. Scarify and recompact the existing subgrade to a depth of at least 6 inches before placing the first lift of embankment fill or as directed by the Engineer.

B. Embankment fill shall consist of common fill material, placed, and compacted in even lifts of 12 inches (uncompacted thickness).

C. Rock may be used in embankment fill only with prior, written approval of the Engineer.

3.09 IMPERVIOUS FILL (NOT USED)

3.10 UNDERCUT AND BACKFILL WITH OVERSIZE ROCK

A. Excavate the area to the lines and grades shown on the Drawings, or as directed by the Engineer, and dispose of undercut material in an approved manner. Place soil stabilization (geotextile) fabric within the undercut area by hand and backfill with a minimum of 18 inches of oversize rock. The top 4 to 6 inches of backfill shall be crushed stone or Class 7 base course material. The cost of the topping or choke layer shall be considered incidental to the cost of the oversize rock, and it will not be paid for separately.

B. Accomplish the placement of backfill material from the leading edge of the fill. Haul vehicles will only be allowed on compacted fill material and shall not be allowed with the undercut excavation.

C. Prior to placement of the crushed stone or Class 7 base course, compact and lock together the oversize rock with a minimum of two (2) passes of a vibratory roller or dozer, of weight and size acceptable to the Engineer. Proof roll the finished choke layer and install additional material as necessary to address any resulting wheel ruts.

3.11 GRADING

A. Perform grading to the lines and grades shown on the Drawings. Remove all objectionable material encountered within the limits indicated and dispose of off-site. Provide complete and continuous drainage and dewatering of subgrades throughout the grading process. Install temporary drains, drainage ditches, etc., to intercept or divert surface water that may affect the execution or condition of grading work.

B. If at the time of grading it is not possible to place any material in its proper section of the Work, stockpile the fill material in approved area for later use. No extra payment will be made for the stockpiling or double handling of excavated or borrow material.

C. Stones or rock fragments larger than 3 inches in their greatest dimensions will not be permitted within the top 6 inches of the finished grade of fills and embankments.

D. In cut areas, remove all loose or protruding rocks in slopes to line or finished grade of the slope. Dress all cut and fill slopes in a uniform manner to the grade, cross-section and alignment shown on the Drawings unless otherwise directed by the Engineer.

3.12 DISPOSAL OF UNSUITABLE, WASTE AND/OR SURPLUS EXCAVATED MATERIAL

A. Remove and dispose of unsuitable, waste, and surplus excavated material off-site. Materials may be temporarily stockpiled in an area within the limits of construction that do not disrupt construction activities, create any nuisances or safety hazards, or otherwise restrict access to the site of the Work.

3.13 FIELD TESTING

A. Prior to and during the placement of backfill and fill, coordinate with the soils testing laboratory to perform in-place soil density tests to verify the existing subgrade soil meets the requirements herein. Unless otherwise noted, conduct testing in accordance with the following minimum frequencies:

B. Determine a moisture-density relationship for each type of subgrade, backfill and embankment fill material encountered, and conduct testing in accordance with AASHTO T 99 or T 180 (ASTM D698 or D1557).

C. Conduct field density and moisture testing of earthwork subgrade in accordance with AASHTO T 310 (ASTM D6938). Conduct in-place density and moisture testing at a frequency of one (1) test per 5,000 square-feet of subgrade.

D. Conduct field density and moisture testing of backfill and embankment fill in accordance with AASHTO T 310 (ASTM D6938). Conduct in-place density and moisture testing at a frequency of one (1) test per 750 square-yards of area in each lift of embankment. Conduct a minimum of two (2) tests per lift of backfill.

3.14 TOLERANCES

A. Accomplish all grading to the tolerances listed below for the various areas and classes of work as shown on the Drawings. The tolerances listed are maximum variations that will be acceptable for each class of work without exception.

B. Form and compact the subgrade beneath structures to within 0.05 foot of the finished subgrade as established by grade hubs or stakes.

C. Rough grade all areas outside of those mentioned in the previous paragraphs and which do not receive any type of a finished structure to within 0.10 foot of the finished grade after the necessary allowances have been made for the thickness of topsoil. This tolerance shall be reduced as necessary to provide drainage at all points and to prevent the formation of water pockets in the finished grading.

D. Any deviation in excess of the amount shown above shall be corrected by loosening, adding, or removing materials, reshaping and recompacting by sprinkling and rolling.

3.15 TOPSOIL

A. Stockpile topsoil stripped from within the project limits at an off-site location provided by the Contractor unless on-site stockpile areas are designated on the Drawings. Stockpile the topsoil in such a manner that other materials will not become intermixed and interfere with reuse of topsoil. Strip topsoil from the designated areas to a minimum depth of 6 inches unless otherwise indicated on the Drawings.

B. When suitable topsoil is not available on the site, locate and obtain a supply subject to the approval of the Engineer. Notify the Engineer sufficiently in advance of operations in order that necessary measurements and tests can be made. See Section 02920, Seeding or Section 02921, Sodding for topsoil material requirements.

C. Immediately prior to dumping and spreading the topsoil on any area, loosen the surface by discing or by other means approved by the Engineer. Loosen the subgrade to a minimum depth of 2 inches to facilitate bonding of the topsoil. Clear the surface of the area of stones 2 inches and larger stones and all litter.

D. Spread the topsoil evenly on the prepared areas to a uniform depth of 4 inches after compaction. Do not spread topsoil when the ground or topsoil is frozen, excessively wet, or otherwise in a condition detrimental to the work. Carry out spreading so that seeding or sodding operations can proceed with a minimum of soil preparation or tilling. After spreading is completed, the topsoil shall be smooth-graded and the surface left at the prescribed grades in an even, properly compacted condition. Prevent the formation of low places or pockets where water will stand on the finished subgrade. Light rolling with placing or spreading equipment and wetting if needed, will be required to consolidate the topsoil to the finished grades.

3.16 SITE RESTORATION

A. Unless otherwise indicated on the Drawings, restore all disturbed areas with seed, lime, fertilizer, and mulch in accordance with Section 02920, Seeding or Section 02921, Sodding.

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SECTION 02282

TERMITE CONTROL

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Provide soil treatment for termite control for all buildings constructed under this project.

1.02 MATERIALS COMPLIANCE WITH AIS

A. P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), includes an “American Iron and Steel (AIS)” requirement in section 436 that requires Clean Water State Revolving Loan Fund (CWSRF) and Drinking Water State Revolving Loan Fund (DWSRF) assistance recipients to use iron and steel products that are produced in the United States for projects for the construction, alteration, maintenance, or repair of a public water system or treatment works. This Project meets the definition of such work, and the Environment Protection Agency (EPA) implementation requirements for this AIS requirement are outlined within the DWSRF memorandum titled “Implementation of American Iron and Steel provisions of P.L. 113-76, Consolidated Appropriations Act, 2014” included as part of the RLF Supplemental General Conditions.

B. All parties are required to comply with these requirements and to ensure that all qualifying iron and steel products used in this project must be produced in the United States. See RLF Supplemental General Conditions for additional details.

1.03 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.04 SUBMITTALS

A. See Section 01300 – Submittals

B. Submit the following:

1. Product data and application instructions

2. Certification that products comply with U.S. Environmental Protection Agency (EPA) regulations for termiticides

1.05 QUALITY ASSURANCE

A. In addition to requirements of these specifications, comply with manufacturer's instructions and recommendations for preparing substrate and application.

B. Engage a professional pest control operator who is licensed according to regulations of governing authorities to apply soil treatment solution.

C. Use only termiticides that bear a federal registration number of the EPA and are approved by local authorities having jurisdiction.

1.06 JOB CONDITIONS

A. Restrictions: Do not apply soil treatment solution until excavating, filling, and grading operations are completed, except as otherwise required in construction operations.

B. To ensure penetration, do not apply soil treatment to frozen or excessively wet soils or during inclement weather. Comply with handling and application instructions of the soil toxicant manufacturer.

1.07 WARRANTY

A. Furnish written warranty, executed by Applicator and Contractor, certifying that applied soil termiticide treatment will prevent infestation of subterranean termites. If subterranean termite activity is discovered during warranty period, Contractor will re-treat soil and repair or replace damage caused by termite infestation.

B. Warranty Period: Five (5) years from date of Substantial Completion.

C. The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

PART 2 PRODUCTS

2.01 SOIL TREATMENT SOLUTION

A. General: Use an emulsible, concentrated termiticide that dilutes with water, specially formulated to prevent termite infestation. Fuel oil will not be permitted as a dilutent. Provide a solution consisting of one of following chemical elements.

B. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:

1. Chloropyrifos: Dursban TC, Dow Chemical Co.
2. Permathrin: Dragnet FT, FMC Corp., Torpedo, ICI Americas, Inc.
3. Cypermethrine: Prevail FT, FMC Corp., Demon, ICI Americas, Inc.
4. Fenvalerate: Gold Coast Tribute, Du Pont.
5. Isofenphose: Pryfon, Mobay Corp.

C. Dilute with water to concentration level recommended by manufacturer.

D. Other solutions may be used as recommended by Applicator if approved for intended application by local authorities having jurisdiction. Use only soil treatment solutions that are not harmful to plants.

PART 3 EXECUTION

3.01 APPLICATION

A. Surface Preparation: Remove foreign matter that could decrease treatment effectiveness on areas to be treated. Loosen, rake, and level soil to be treated, except previously compacted areas under slabs and foundations. Toxicants may be applied before placing compacted fill under slabs if recommended by toxicant manufacturer.

B. Application Rates: Apply soil treatment solution as follows:

1. Under slab-on-grade structures, treat soil before concrete slabs are placed, using the following application rates:

   a. Apply four (4) gallons of chemical solution per 10 linear feet to soil in critical areas under slab, including entire inside perimeter of foundation walls, along both sides of interior partition walls, around plumbing pipes and electric conduit penetrating slab, and around interior column footers.

   b. Apply one (1) gallon of chemical solution per 10 square feet as an overall treatment under slab and attached slab areas where fill is soil or unwashed gravel. Apply 1 1/2 gallon of chemical solution per 10 square feet to areas where fill is washed gravel or other coarse absorbent material.

   c. Apply four (4) gallons of chemical solution per 10 linear feet of trench for each 12 inches of depth from grade to footing, along outside edge of building. Dig a trench 6 to 8 inches wide along outside of foundation to a depth of not less than 12 inches deep. Punch holes to top of footing at not more than 12 inches on-center and apply chemical solution. Mix chemical solution with the soil as it is being replaced in the trench.

2. At hollow masonry foundations or grade beams, treat voids at rate of two (2) gallons per 10 linear feet, poured directly into the hollow spaces.

3. At expansion joints, control joints, and areas where slabs will be penetrated, apply at rate of four (4) gallons per 10 linear feet of penetration.

C. Post signs in areas of application to warn workers that soil termiticide treatment has been applied. Remove signs after areas are covered by other construction.

D. Reapply soil treatment solution to areas disturbed by subsequent excavation, landscape grading, or other construction activities following application.

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SECTION 02315

EXCAVATION, TRENCHING AND BACKFILLING

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment, and incidentals required to perform all trenching for pipelines, storm drains, buried appurtenances, and other associated construction. Work shall include excavation, bedding, backfilling, disposal of surplus or unsatisfactory soil material, and restoration of trench surfaces and easements.

B. Excavation shall extend to the width and depth shown on the Drawings or as specified herein, and it shall provide suitable room for installing pipe, structures, and appurtenances.

1.02 MATERIALS COMPLIANCE WITH AIS

A. P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), includes an “American Iron and Steel (AIS)” requirement in section 436 that requires Clean Water State Revolving Loan Fund (CWSRF) and Drinking Water State Revolving Loan Fund (DWSRF) assistance recipients to use iron and steel products that are produced in the United States for projects for the construction, alteration, maintenance, or repair of a public water system or treatment works. This Project meets the definition of such work, and the Environment Protection Agency (EPA) implementation requirements for this AIS requirement are outlined within the DWSRF memorandum titled “Implementation of American Iron and Steel provisions of P.L. 113-76, Consolidated Appropriations Act, 2014” included as part of the RLF Supplemental General Conditions.

B. All parties are required to comply with these requirements and to ensure that all qualifying iron and steel products used in this project must be produced in the United States. See RLF Supplemental General Conditions for additional details.

1.03 RELATED SECTIONS

A. Section 01111 – Site Conditions

B. Section 01300 – Submittals

C. Section 01450 – Field Quality Control

D. Section 01665 – Trench Safety Requirements

E. Section 02100 – Site Preparation

F. Section 02140 – Dewatering and Drainage

G. Section 02200 – Earthwork

H. Section 02316 – Structural Excavation, Backfilling and Grading

I. Section 02370 – Erosion and Sedimentation Control

J. Section 02501 – Pavement and Drainage Improvements

K. Section 02510 – Water Distribution

L. Section 02530 – Sanitary Sewers

M. Section 02920 – Seeding

N. Section 02921 – Sodding

O. Section 03300 – Cast-In-Place Concrete

1.04 REFERENCE STANDARDS

A. American Association of State Highway and Transportation Officials (AASHTO), latest edition:

1. AASHTO M 57 Standard Specification for Materials for Embankments and Subgrades

2. AASHTO M 145 Standard Specification for Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes

3. AASHTO M 146 Standard Specification for Terms Relating to Subgrade, Soil-Aggregate, and Fill Materials

4. AASHTO T 99 Standard Method of Test for Moisture-Density Relations of Soils Using a 2.5-kg (5.5-lb) Rammer and a 305-mm (12-in.) Drop

5. AASHTO T 180 Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop

6. AASHTO T 310 Standard Specification for In-Place Density and Moisture Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

B. ASTM International (ASTM), latest edition:

1. ASTM C33 Standard Specification for Concrete Aggregates

2. ASTM D698 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3 (600 kN-m/m^3))

3. ASTM D1557 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3 (2,700 kN-m/m^3))

4. ASTM D2487 Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)

5. ASTM D6938 Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

C. Occupational Safety and Health Administration (OSHA), latest edition:

1. All excavations and support systems shall conform to applicable OSHA excavation, trenching, and shoring standards that are contained in the U.S. Code of Federal Regulations 29 CFR 1926.650-1926.653, and other federal, state or local requirements. In the event of a conflict, comply with the more restrictive applicable requirements.

2. The current edition of Occupational Safety and Health Administration Standard for Excavation and Trench Safety Systems, 29 CFR 1926, Subpart P, is specifically incorporated and made a part of these specifications and contract documents as required by Arkansas Code Annotated 22-9-212.

1.05 DEFINITIONS

A. Trench Excavation: The removal of materials encountered in trenches to the depths as shown on the Drawings or as directed by the Engineer.

B. Rock Excavation: Sedimentary rock which, by demonstration, cannot be excavated with equipment weighing at least 50,000 pounds and having at least 140 net horsepower (140 hp), equipped with a ripper or similar approved equipment without prior systematic drilling and blasting or breaking with power-operated rock excavation tools. The Engineer may waive the demonstration if the material encountered is well-defined rock.

C. Undercut Excavation: The removal and disposal of undesirable material and replacement with select material or other approved backfill below finished subgrade or below existing grade in areas of proposed embankment. Undesirable material shall include deposits of saturated or unsaturated mixtures of soils and organic matter not suitable for subgrade or foundation material. The Engineer shall determine the need and extent of Undercut Excavation and may designate as unsuitable those soils that cannot be stabilized in place through normal drying and compactive efforts when satisfactory weather and ground conditions exist.

1.06 SUBMITTALS

A. See Section 01300, Submittals, for submittal procedures.

B. Submit the proposed methods of excavation, backfilling, and compaction for review.

C. Submit an excavation and trench safety plan to the Engineer for review for excavations greater than or equal to 5 feet deep.

D. Furnish test data to indicate compliance of backfill, bedding and compaction with this specification in compliance with Section 01450, Field Quality Control.

E. Furnish test data to indicate compliance of materials from off-site sources.

1.07 QUALITY ASSURANCE

A. Responsibilities for providing the quality control and quality assurance testing activities are defined in Section 01450, Field Quality Control. Testing frequencies are defined under the paragraph on Field Testing at the end of this Section.

B. Furnish manufacturer or supplier certification for all products and materials from off-site sources for approval by the Engineer. Materials shall include but not be limited to select material, topsoil, sand, rock, and crushed stone. Provide initial material certifications at no additional cost to the Owner.

1.08 COORDINATION

A. Completely coordinate the work of this Section with the work of other sections. Verify at the site both the dimensions and work of other trades adjoining items of work in this Section before commencement of items herein specified.

B. Furnish to the pertinent trades all items included under this Section that are to be built into the work of other sections.

1.09 FIELD MEASUREMENTS

A. Take field measurements at the site to verify or supplement indicated dimensions and to ensure proper coordination of all other construction items.

PART 2 PRODUCTS

2.01 BEDDING

A. General

1. Pipe bedding shall conform to the class specified on the Drawings or in the Bid Form. When no bedding class is specified, the requirements for Class "B" bedding shall apply. If trench conditions are mucky, bedding shall be Class "B".

B. Class "B" Granular Bedding

1. Class "B" Granular Bedding: Crushed stone or gravel, well graded, and containing several sizes of particles ranging to 3/4-inch maximum, unless otherwise approved by the Engineer, the material shall meet the requirements of a modified ASTM C33, Gradation 67 with a maximum aggregate size of 3/4-inch.

C. Class "D" Bedding

1. Class "D" Bedding: Firm soil excavated from the trench and free of rocks, which will provide uniform bearing for the full length of the pipe barrel.

2. Excavate bell holes in the trench at each joint to permit proper jointing and to prevent the joint of the pipe from being a point of support. Correct over excavation of any

portion of the trench with thoroughly compacted soil material approved by the Engineer.

2.02 TRENCH BACKFILL

A. Trench backfill under unpaved areas shall consist of on-site backfill or select backfill. When no material requirements are specified, the Contractor may use soil material excavated from the trench as backfill, provided that it meets the requirement of On-Site Backfill. If trench spoil is wet, rocky, or contains other objectionable materials, the Contractor shall furnish and install Select Backfill. Unacceptable trench spoil shall be wasted in a manner approved by the Engineer

B. Unless otherwise indicated on the Drawings, backfill for trenches and structures under paved areas, parking lots, paved and gravel driveways, alleys, sidewalks, and under curb and gutter shall be Slurry Backfill.

C. On-Site Backfill: Backfill shall consist of on-site material excavated from the trenches except where the Drawings require the use of special backfill materials or as directed by the Engineer. On-site backfill material shall be free of rocks, clods, or frozen masses over 3 inches in diameter or organic matter. The Engineer will approve backfill material prior to placement in the trench.

D. Select Backfill: Select backfill must be free of sod, stumps, logs, roots, or other perishable or deleterious matter. It shall be a granular material with a maximum particle size of 3 inches, well-graded from coarse to fine. The select material shall conform to AASHTO classification A-1, A-2-4 or A-2-5, or with the Engineer's approval, a sandy or gravely clay conforming to classification A-2-6 or A-6. The following additional restrictions apply:

1. Select backfill material classified as AASHTO A-2-6 may be submitted for review and evaluation by the Engineer provided that it has a plasticity index less than 15

2. Select backfill material classified as AASHTO A-6 may be submitted for review and evaluation by the Engineer provided that it has a plasticity index less than 15

3. Evaluation of A-2-6 or A-6 material shall not imply any obligation of the Engineer to accept it for use in the Work

4. Crusher screenings, including nepheline syenite granite fines (Donna Fill®) will not be allowed as select fill or backfill material

5. The Contractor shall furnish certified test results to indicate compliance of select material with this specification at no additional cost to the Owner

6. Select material with more than 30 percent (30%) retained on a No. 4 sieve may be tested in accordance with ASTM D1557

E. Slurry Backfill (Flowable Fill or Utility Backfill): A plant mixed slurry of sand, cement, fly ash, and water in a ratio of 3,185 lb.: 150 lb.: 100 lb.: 46 gal. The slurry mixture shall achieve a maximum compressive strength of 400 psi at 28 days.

PART 3 EXECUTION

3.01 GENERAL

A. Excavate the trench so that the pipe can be laid to the required lines and grades as indicated on the Drawings. Do not deviate from the required line or grade except with the written consent of the Engineer.

B. Grade the trench to the approximate depth shown on the Drawings and maintain a depth that will provide not less than 30 inches of cover from the top of the pipe to the finished surface of the ground. Install the pipe to a grade such that the entire line will have a minimum number of high and low points. At utility or street crossings requiring greater line depth, install the pipe approach to the crossing on a gradual and uniform grade.

C. Whenever obstructions not shown on the plans are encountered during the progress of the work and interfere to such an extent that an alteration in the plans is required, the Engineer shall have the authority to change the plans and order a deviation from the line and grade or arrange with the owners of the structures for the removal, relocation, or reconstruction of the obstructions.

D. Furnish temporary support and provide adequate protection and maintenance of all underground and surface utility structures, drains, conduits, sewers, and other structures encountered in the progress of the work at no additional cost to the Owner. Where the grade or alignment of the pipe is obstructed by existing structures, the Contractor shall permanently support, relocate, remove, or reconstruct the obstruction in cooperation with the owners of such utility structures. Determine the location of existing underground utility structures, including coordinating utility location services, examining available records, and making all explorations and excavations necessary to determine the exact location of the underground utility.

E. Proceed with caution in the excavation and preparation of the trench to determine the exact location of underground structures and utilities, both known and unknown. The Contractor is responsible for the repair of structures broken or otherwise damaged because of careless construction procedures.

F. Do not advance the excavation of trenches more than 150 feet ahead of the completed pipe work and completed backfill without permission from the Engineer. Refer to other sections of these Specifications for the requirements for cutting and replacing pavements.

G. Lay water mains at least 10 feet horizontally from any existing or proposed gravity or pressure sewer. Measure the distance from edge to edge. In cases where it is not practical to maintain 10 feet of separation, or if water and sewer lines must be laid in the same ditch, prior written approval is necessary from the Arkansas Department of Health and the Engineer.

H. Vertical separation of water and sewer mains at crossings shall provide a minimum of 18 inches of clearance between the bottom of the water line and the top of the sewer line. At crossings, lay one (1) full section of water pipe (18 to 20 feet long) such that both joints are installed as far from the sewer crossing as possible (centered on the sewer line). The

Engineer may require special structural support of the water and/or sewer line, such as clay, concrete, or pipe encasement.

1. If the vertical separation must be reduced, encase the water line or the sewer line in watertight pipe with sealed watertight ends extending at least 10 feet either side of the crossing. Mechanically restrain any pipe joint located inside the encasement pipe. The encasement pipe may be vented to the surface if carrying water or sewer under pressure. Where a water line must pass beneath the sewer line, maintain at least 18 inches of vertical separation between the outside of the two pipes in addition to the preceding encasement requirement. Exceptions to these requirements must be approved in writing by the Arkansas Department of Health and the Engineer.

I. Cut and repair street and highway crossings in accordance with the requirements of the local municipality or government agency. Obtain street or road cut permits for all such cuts from the appropriate authority. Provide traffic control signage, flaggers, etc. in accordance with the permit conditions. For street cuts near traffic signals, coordinate the work with the local street and traffic control department.

3.02 EXCAVATION

A. Excavate all the material encountered within the lines and grades shown on the Drawings and as specified and directed by the Engineer. Saw all paved driveway, parking lot and street cuts at the trench limits or as indicated on the Drawings.

B. Below a point 12 inches above the outside top of the pipe, the trench shall have vertical sides and shall have a minimum width as detailed on the Drawings. If no details are shown on the Drawings, the minimum trench width shall be equal to the outside pipe diameter plus 18 inches and a maximum width equal the outside pipe diameter plus 30 inches.

C. At any point where the width of the lower portion of the trench exceeds these limits, the Contractor shall take corrective measures. As directed by the Engineer, the Contractor shall provide either pipe of adequate strength, special pipe embedment, or a concrete cradle as required by the loading conditions. Furnish and install these corrective items at no additional cost to the Owner.

D. Stockpile material suitable for backfilling in an orderly manner a sufficient distance from the banks of the trench to avoid overloading and to prevent slides or cave-ins. Remove or waste all excavated materials not required or unsuitable for backfill as indicated in the Specifications or as directed by the Engineer.

E. Where necessary to protect the labor, the work or adjacent property, provide and install shoring. Furnish and install shoring or other trench protection of suitable dimensions and strength to prevent the settlement or movement of the ground adjacent to the trench and to prevent damage to surface or subsurface structures. The Contractor is solely responsible for the determining the need and adequacy of the sheeting and bracing. The shoring shall remain in place until the backfill has proceeded to a point where it can safely be removed. If in the opinion of the Engineer damage is likely to result from withdrawing the shoring, it shall remain in place. Unless otherwise indicated on the bid form, the Owner will make no separate payment for sheeting, shoring, and bracing.

F. If the soil at the bottom of the trench is unstable and in such condition that it cannot be properly graded, excavate the trench to a depth determined by the Engineer and backfill to grade with crushed stone or gravel well compacted by tamping.

G. Dewater all excavated trenches before any construction is undertaken therein. Lay all piping in dry trenches and place all concrete only upon dry and firm foundation material. The Contractor shall pump, bail, or temporarily provide drainage for any water encountered.

H. Should the specified methods of dewatering the trenches be unsuccessful, excavate the trench to a depth of approximately 6 inches below grade, and then backfill the trench to grade with gravel bedding. Form a sump below the gravel to provide a place for a pump to take suction and thus lower the water level to a point below the bottom of the lowest pipe joint. Continue the pumping until all pipe joints have been placed and the presence of water will not injure them. Do not commence backfilling until the trench has been dewatered.

I. If rock is present at the grade line of the trench, excavate it to an elevation approximately 6 inches below grade. Rock excavation shall include boulders and deposits of concrete with a volume of 1/2 cubic-yard or more. Backfill the trench to grade with crushed stone or gravel prior to laying the pipe. Remove and dispose of all excavated rock from the site.

J. When indicated on the Drawing or as directed by the Engineer, construct an impervious dam or bulkhead in the trench to interrupt the unnatural flow of groundwater after construction. Key the dam into the trench bottom and sidewalls. Where directed, provide at least one (1) clay or other impervious material dam in the trench line every 300 linear feet of pipe or between each manhole.

K. Avoid heavy machinery traffic above installed pipe until at least 3 feet of trench backfill is placed and compacted. Monitor pipe deflection during trench backfill.

3.03 BEDDING

A. Bed all pipe accordance with Subsection 2.01.

B. Prior to installation of the pipe, shape the bedding to provide uniform support for the bottom quadrant of the pipe barrel.

C. Accomplish the placement of material on each side of pipe (haunching) and immediately above the top of the pipe (initial backfill) in a manner that will prevent displacement or deflection of the pipe.

3.04 BACKFILLING

A. Backfill all trenches immediately after the pipe is laid and approved. Install backfill by methods that will not disturb the pipe. Repair pavement cuts with paving materials of the type and design of the original surface. Do not commence pavement repair until the Contractor has achieved proper subgrade compaction. Such backfilling, before pipeline testing, shall not relieve the Contractor of responsibility for correction of leaks in the line.

B. Place backfill up to a level of 12 inches above the top of the pipe by hand shoveling or other approved methods, and deposit backfill in maximum layers of 4 inches. Compact each layer by mechanical tamping, and do not displace pipe during tamping of the backfill. Control the moisture content of the backfill material as required to obtain the specified compaction.

C. From a point 12 inches above the top of the pipe, place backfill by any approved method that will not injure or disturb the pipe and will result in the specified compaction.

D. Unless otherwise noted on the Drawings or more stringent requirements are established by other specification sections, place and insure backfill and fill material to achieve an equal or greater degree of compaction than undisturbed material adjacent to the work. However, in no case shall the degree of compaction fall below the percentages of the maximum density, at optimum moisture content, as indicated in Table 1 below. The moisture content of compacted backfill shall be within plus or minus 2 percent (2% ±) of the optimum moisture content.

Table 1
Minimum Compaction Limits for Trench Backfill Material

Location	Required Density
Within 25 feet of buildings and structures	100% of the maximum dry density by Standard Proctor test, AASHTO T 99 (ASTM D698)
Within city streets and alleys, and under parking lots, paved and gravel driveways, county roads, and sidewalks	Trench backfill shall be with slurry in accordance with the Standard Details, unless otherwise indicated on the Drawings
Specific areas noted on the Drawings	95% of the maximum dry density by Standard Proctor test, AASHTO T 99 (ASTM D698)
Areas under turf, sodded, planted, or seeded non-traffic areas	90% of the maximum dry density by Standard Proctor test, AASHTO T 99 (ASTM D698)

E. When conflicts exist between these densities due to location or depth of trench, obtain the higher specified density. Compaction densities and testing frequencies for pavement sections are defined in Section 02501, Pavement and Drainage Improvements.

F. Replace or rework material or workmanship that fails to meet the specified requirements.

G. All trenches shall be backfilled, settled, and the ground restored to its original condition as soon as possible after the pipe is installed. Any unnecessary delay in restoring trenches to their original condition shall constitute just cause for stopping all other work until the trenches are so restored. The Contractor also shall refill trenches as often as necessary to bring them back to original grade, and during the period when settlement is occurring shall refill them frequently to maintain traffic.

H. If at any time within 12 months after the completion and final acceptance of the work embraced in this Contract, there shall be any settlement of the trenches requiring repairs

to be made, the Owner may notify the Contractor to make such repairs as may be necessary. Should the Contractor fail to do so within 15 days after the date of such notice or should the nature of such defect be such as to require immediate attention, the Owner shall make such repairs as may be necessary and bill the actual cost of such repairs to the Contractor.

3.05 FIELD TESTING

A. Unless otherwise noted, conduct testing in accordance with the following minimum frequencies:

1. Determine a moisture-density relationship for each type of subgrade and backfill material encountered and conduct testing in accordance with AASHTO T 99 or T 180 (ASTM D698 or D1557).

2. Conduct field density and moisture testing of initial trench subgrade and all backfill in accordance with AASHTO T 310 (ASTM D6938). Minimum compaction limits for trench backfill are defined under Paragraph 3.04, Backfilling, Table 1.

3. Testing frequencies for in-place density and moisture are indicated in Table 2 below.

Table 2
Minimum Compaction Testing Frequencies for Trench Backfill Material

Location	Required Density
Within 25 feet of buildings and structures	One (1) moisture-density test per 50 linear-feet, every lift of backfill, minimum of (2) tests
Within city streets and alleys, and under parking lots, paved and gravel driveways, county roads, and sidewalks	Trench backfill shall be with slurry in accordance with the Standard Details, unless otherwise indicated on the Drawings
Specific areas noted on the Drawings	One (1) moisture-density test per 400 linear-feet, every lift of backfill
Areas under turf, sodded, planted, or seeded non-traffic areas	Conduct moisture-density tests at the locations and frequencies as directed by the Engineer.

4. Should any moisture-density test fail to meet the specified requirements, the Contractor shall perform corrective work necessary to bring the material into compliance and retest the failed area at no additional cost to the Owner.

3.06 SLURRY BACKFILL

A. Under city streets and alleys, parking lots, paved and gravel driveways, sidewalks, and curb and gutter, backfill trenches with Slurry Backfill. The Contractor shall use this material to help facilitate the reapplication of traffic over the trenches across streets and driveways where directed by the Engineer. The Engineer may modify the design as

required by the construction conditions. Place slurry to neat trench lines as indicated on the plans, not to exceed a trench quantity 24 inches wider than the diameter of the pipe in the trench or as indicated on the Drawings.

B. The Engineer may direct the Contractor to place a temporary surface over the slurry. The Contractor shall consult the trenching details in the Drawings as to the required depth of bedding, slurry backfill, and surfacing material depths. This procedure may be used for drainage, water lines, sanitary sewer lines or other pavement crossings.

C. Allow slurry backfill to achieve a 24-hour set before allowing traffic on it, or before the placement of base course or paving materials. Provide temporary steel plates to facilitate opening streets to traffic. Protect slurry backfill against frost and rapid drying.

3.07 EXPLOSIVES

A. Explosives are prohibited for excavation.

END OF SECTION

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SECTION 02316

STRUCTURAL EXCAVATION, BACKFILLING AND GRADING

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment, and incidentals necessary to perform structural excavation work, grading; placement and compaction of backfill and embankment fill; and the removal and disposal of unsuitable, waste and surplus excavation materials.

B. Furnish and install temporary excavation support systems, including sheeting, shoring and bracing, to ensure the safety of personnel and protect adjacent structures, piping, etc., in accordance with federal, state and local laws, regulations and requirements.

C. Provide the services of a licensed professional engineer, registered in the State in which the Work will occur, to prepare temporary excavation support system designs and submittals.

1.02 MATERIALS COMPLIANCE WITH AIS

A. P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), includes an “American Iron and Steel (AIS)” requirement in section 436 that requires Clean Water State Revolving Loan Fund (CWSRF) and Drinking Water State Revolving Loan Fund (DWSRF) assistance recipients to use iron and steel products that are produced in the United States for projects for the construction, alteration, maintenance, or repair of a public water system or treatment works. This Project meets the definition of such work, and the Environment Protection Agency (EPA) implementation requirements for this AIS requirement are outlined within the DWSRF memorandum titled “Implementation of American Iron and Steel provisions of P.L. 113-76, Consolidated Appropriations Act, 2014” included as part of the RLF Supplemental General Conditions.

B. All parties are required to comply with these requirements and to ensure that all qualifying iron and steel products used in this project must be produced in the United States. See RLF Supplemental General Conditions for additional details.

1.03 RELATED SECTIONS

A. Section 01300 – Submittals

B. Section 01450 – Field Quality Control

C. Section 01665 – Trench Safety Requirements

D. Section 02100 – Site Preparation

E. Section 02140 – Dewatering and Drainage

F. Section 02200 – Earthwork

G. Section 02315 – Excavation, Trenching and Backfilling

H. Section 02370 – Erosion and Sedimentation Control

I. Section 02375 – Riprap

J. Section 02920 – Seeding

K. Section 02921 – Sodding

1.04 REFERENCE STANDARDS

A. American Association of State Highway and Transportation Officials (AASHTO), latest edition:

1. AASHTO M 57 Standard Specification for Materials for Embankments and Subgrades

2. AASHTO M 145 Standard Specification for Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes

3. AASHTO M 146 Standard Specification for Terms Relating to Subgrade, Soil-Aggregate, and Fill Materials.

4. AASHTO T 99 Standard Method of Test for Moisture-Density Relations of Soils Using a 2.5-kg (5.5-lb) Rammer and a 305-mm (12-in.) Drop

5. AASHTO T 180 Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop

6. AASHTO T 310 Standard Specification for In-Place Density and Moisture Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

B. ASTM International (ASTM), latest edition:

1. ASTM C33 Standard Specification for Concrete Aggregates

2. ASTM D698 Standard Test Methods for Laboratory Compaction Characteristics of Soils Using Standard Effort (12,400 ft-lbf/ft^3 (600 kN-m/m^3))

3. ASTM D1557 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3 (2,700 kN-m/m^3))

4. ASTM D4318 Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

5. ASTM D6938 Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

C. Occupational Safety and Health Administration (OSHA), latest edition:

1. All excavations and support systems shall conform to applicable OSHA excavation, trenching, and shoring standards that are contained in the U.S. Code of Federal Regulations 29 CFR 1926.650-1926.653, and other federal, state or local requirements. In the event of a conflict, comply with the more restrictive applicable requirements.

2. The current edition of Occupational Safety and Health Administration Standard for Excavation and Trench Safety Systems, 29 CFR 1926, Subpart P, is specifically incorporated and made a part of these specifications and contract documents as required by Arkansas Code Annotated 22-9-212.

1.05 DEFINITIONS

A. Where the phrase "in-the-dry" is used in these Specifications, it shall be defined to mean a soil condition where the in-place moisture content of the soil is no more than two percent (2%) above the optimum moisture content of that soil. The optimum moisture content shall be as determined by the laboratory test of the moisture-density relationship appropriate to the specified level of compaction, unless otherwise recommended in the geotechnical report. See also Section 02140, Dewatering and Drainage.

B. Where used in this Specification "structures" refers to all buildings, wet wells, manholes and below grade vaults. Stormwater structures and duct banks are not considered “structures” in this context.

1.06 SUBMITTALS

A. See Section 01300, Submittals, for submittal procedures.

B. Submit the proposed methods of construction, including excavation, backfilling and filling, compaction, and designs for excavation support systems for the various portions of the Work. Excavation support system designs shall be prepared by a Professional Engineer, licensed in the state in which the work is located and having a minimum of five (5) years of professional experience in the design and construction of excavation support systems. Review by the Engineer will be for information purposes only. Contractor shall remain responsible for the adequacy and safety of construction means, methods and techniques.

C. Submit the proposed methods of excavation, backfilling, and grading for all structures.

D. Submit an excavation and trench safety plan for excavations greater than or equal to 5 feet deep. Submittal of the plan shall be for the Engineer’s review for information purposes only.

E. Furnish test data to indicate compliance of all earthwork materials, placement, and compaction methods with this specification, including off-site material proposed for the Project.

1.07 QUALITY ASSURANCE

A. Responsibilities for providing the quality control and quality assurance testing activities are defined in Section 01450, Field Quality Control. Testing frequencies are defined under the paragraph on Field Testing at the end of this Section.

B. Furnish manufacturer or supplier certification for all products and materials from off-site sources for approval by the Engineer. Materials shall include but not be limited to select material, clay, and crushed stone. Provide initial material certifications at no additional cost to the Owner.

1.08 PROJECT SITE CONDITIONS

A. Subsurface Conditions

1. The availability and reliability of geotechnical and other subsurface information known to the Owner is defined in Specification Section 01111, Site Conditions. Do not assume that materials other than those disclosed by the soil borings or test pits will not be encountered, or that the proportions or character of the various materials will not vary from those indicated in the geotechnical investigation report. Any conclusions drawn by the Contractor from the investigation report including the character of the materials to be encountered and degree of difficulty to be expected in the performance of the Work are the sole responsibility of the Contractor.

2. The Contractor is encouraged to perform an independent subsurface investigation. Coordinate access to the site with the Owner.

3. No claim for extra compensation or extension of time will be considered because of any variation in site, soil, or water conditions described in the geotechnical report to that encountered during construction.

1.09 COORDINATION

A. Coordinate the work of this Section with the work of other sections. Verify at the site both the dimensions and work of other trades adjoining items of work in this Section before commencement of items herein specified.

B. Furnish to the pertinent trades all items included under this Section that are to be built into the work of other sections.

1.10 FIELD MEASUREMENTS

A. Take field measurements at the site to verify or supplement indicated dimensions and to ensure proper coordination of all other construction items.

PART 2 PRODUCTS

2.01 COMMON FILL

A. Common Fill: Soil material substantially free of organic materials, topsoil, wood, peat, loam, trash, or other objectionable materials that may be compressible through decomposition or that may not be properly compacted. Common fill shall not contain rocks or stones larger than 3 inches in the largest diameter and shall have a maximum of 75% passing the No. 40 sieve and a maximum of 20% passing the No. 200 sieve. Common fill shall have a maximum liquid limit of 40 and a maximum plasticity index (PI) of 18 (per ASTM D4318).

B. Common fill shall not contain granite blocks, broken concrete, masonry rubble or other similar materials. It shall have physical properties such that it can be readily spread and compacted during filling. Snow, ice, and frozen soil are not permitted. Subject to the Engineer's approval, native material (excluding sandy, lean clay) conforming to these requirements may be used as common fill.

2.02 SELECT BACKFILL

A. Select Backfill: Select backfill must be free of sod, stumps, logs, roots, or other perishable or deleterious matter. It shall be a granular material with a maximum particle size of 3 inches, well-graded from coarse to fine. The select material shall conform to AASHTO classification A-1, A-2-4 or A-2-5, or with the Engineer's approval, a sandy or gravely clay conforming to classification A-2-6 or A-6. The following additional restrictions apply:

1. Select backfill material classified as AASHTO A-2-6 may be submitted for review and evaluation by the Engineer provided that it has a plasticity index less than 18

2. Select backfill material classified as AASHTO A-6 may be submitted for review and evaluation by the Engineer provided that it has a plasticity index less than 18

3. Evaluation of A-2-6 or A-6 material shall not imply any obligation of the Engineer to accept it for use in the Work

4. Crusher screenings, including nepheline syenite granite fines (Donna Fill®) will not be allowed as select fill or backfill material

5. The Contractor shall furnish certified test results to indicate compliance of select material from off-site stockpiles with this specification at no additional cost to the Owner

6. Select backfill with more than 30 percent (30%) retained on a No. 4 sieve may be tested in accordance with ASTM D1557

2.03 CRUSHED AGGREGATE (COARSE DRAIN FILL)

A. Coarse Drain Fill: Crushed aggregate shall be well graded, hard, durable, angular or subangular particles ranging from 3/4-inch maximum diameter to the No. 4 sieve. Unless

otherwise approved by the Engineer, the material shall meet the requirements of ASTM C33, Gradation 67 for coarse aggregate.

PART 3 EXECUTION

3.01 PREPARATION

A. Test Pits

1. Perform exploratory excavation work (test pits) for the purpose of verifying the location of underground utilities and structures and to check for unknown utilities and structures, prior to commencing excavation work.

2. Backfill test pits as soon as the desired information has been obtained. Stabilize backfilled surfaces in accordance with approved erosion and sedimentation control plans (see Section 02370, Erosion and Sedimentation Control).

B. Dewatering and Drainage Systems

1. Temporary dewatering and drainage systems shall be in place and operational prior to beginning excavation work (see Section 02140, Dewatering and Drainage).

3.02 EXCAVATION SUPPORT

A. Furnish, install, monitor, and maintain excavation support (e.g., shoring, sheeting, bracing, trench boxes, etc.) as required by federal, state, or local laws, ordinances, regulations, and safety requirements. Support the sides of excavation, to prevent any movement that could in any way reduce the width of the excavation below that necessary for proper construction and protect adjacent structures from undermining, settlement, or other damage. Take care to prevent the formation of voids outside of sheeting. If voids occur behind sheeting, immediately backfill and compact the voids with common fill material. Fill voids in locations that cannot be properly backfilled and compacted with lean concrete or as indicated by the Engineer.

B. Install excavation supports outside the neat lines of foundations. Supports shall be plumb and securely braced and tied in position. Excavation support shall be adequate to withstand all pressures to which the supports will be subjected. Correct any movement or bulging of supports to provide the necessary clearances, dimensions, and structural integrity.

C. Excavation Supports Left in Place

1. Excavation supports that are required to remain in place, if applicable, are indicated on the Drawings.

2. The Owner or Engineer may direct that certain excavation supports remain in place or be cut off at any specific elevation. If the Contractor believes that such a directive increases Contractor's cost and would thereby entitle Contractor to a change in Contract cost, Contractor shall notify the Engineer in accordance with the Contract documents pertaining to changes in work.

3. The right of the Owner or Engineer to direct that certain excavation supports remain in place shall not be construed as creating any obligation on the Owner or Engineer to give such direction. Furthermore, failure by the Owner or Engineer to give such direction shall not relieve the Contractor from liability for damages to persons or property occurring from or upon the work occasioned by negligence or otherwise, growing out of a failure on the part of the Contractor to leave in place sufficient excavation supports to prevent any movement of the ground or damage to adjacent structures.

D. Remove excavation supports carefully and in such manner so as not to endanger the Work or other adjacent structures, utilities, or property. Fill all voids left or caused by withdrawal of supports immediately with lean concrete or as directed by the Engineer.

3.03 STRUCTURAL EXCAVATION PROCEDURES

A. Excavations for structures shall be suitably wide for construction of the structures including excavation supports, dewatering and drainage systems, and working clearances.

B. Perform excavation in-the-dry and accomplish such by methods that preserve the undisturbed state of subgrade soils. Drainage and dewatering systems shall be in place and operational prior to beginning excavation work. In no case shall the earth be plowed, scraped, or excavated by any means so near to the finished subgrade that would disturb the finished subgrade. Hand excavation of the final 3 to 6 inches may be required to obtain a satisfactory, undisturbed subgrade. Remove subgrade soils that become soft, loose, "quick", or otherwise unsatisfactory for support of structures because of inadequate excavation, dewatering, or other construction methods. Replace subgrade material with crushed stone, subject to prior approval by the Engineer, and at no additional cost to the Owner.

C. Subgrade Preparation: Unless otherwise shown on the Drawings, compact the subgrade for all structures as follows:

1. Compact the top 12 inches of subgrade to a minimum of 95% standard proctor in accordance with AASHTO T 99 (ASTM D698)

2. Where structures are supported by piles or drilled shaft piers, compact the top 12 inches of subgrade to a minimum of 95% standard proctor in accordance with AASHTO T 99 (ASTM D698)

3. Where existing subgrade contains a significant amount of clay or cohesive soils, over-excavate sufficiently below the bottom of the structure, and place a 6-inch minimum working mat of crushed stone or lean concrete. Prior to placement of the working mat, compact the top 12 inches of existing subgrade to a minimum of 95% standard proctor in accordance with AASHTO T 99 (ASTM D698)

D. When excavations have reached the required subgrade, including any allowances for working mats or base materials, and prior to the placement of working mats or base materials, the Contractor shall notify the soils testing laboratory to verify the suitability of the existing subgrade soils for the anticipated foundation and structural loadings. When directed by the Engineer, the Geotechnical Engineer shall inspect the subgrade for

conformance with the specified subgrade preparation requirements. If the existing subgrade soils are determined to be unsuitable, the Engineer will provide direction regarding removal and replacement with suitable materials. If Contractor believes that such a directive increases Contractor's cost and would thereby entitle Contractor to a change in Contract cost, Contractor shall notify the Engineer in accordance with the Contract documents pertaining to changes in work.

E. Over-excavation beyond the limits and depths required by the Contract Documents shall be replaced at no additional cost to the Owner by bedding rock or other approved material subject to the prior approval of the Engineer.

3.04 GENERAL FILLING AND BACKFILLING PROCEDURES

A. Place fill and backfill materials in lifts to suit the specified compaction requirements to the lines and grades required, making allowances for settlement and placement of cover materials (i.e., topsoil, sod, etc.). Correct soft spots or uncompacted areas by reworking.

B. Do not place fill and backfill materials on frozen surfaces, or surfaces covered by snow or ice. Fill and backfill material shall be free of snow, ice, and frozen earth.

C. Compact each layer of fill to a mass density not less than the minimum density specified. The moisture content of compacted backfill shall be within two percent (2%) (+/-) of the optimum moisture content.

D. Compact fill placed adjacent to structures by means of manually directed power tampers or plate vibrators. Unless otherwise specified or approved by the Engineer, do not operate heavy equipment including backhoe mounted power tampers, vibrating compactors, or manually directed vibratory rollers within 2 feet of any structure. Do not operate towed or self-propelled vibrating rollers (with 4 to 6-foot diameter drums) within 10 feet of any structure. Compaction by means of drop weights operating from a crane or hoist will not be permitted. Maximum layer thickness of fill lift for hand compactors or manually directed power tampers shall not exceed 6 inches.

3.05 FILL AND BACKFILL PROCEDURES

A. Fill and backfill material placed immediately adjacent to and within 10 feet of all structures shall be select fill. Complete all watertightness tests and damp proofing and/or waterproofing prior to placing fill or backfill around structures. Backfill may be placed prior to testing with the approval of the Engineer. Place and compact select fill in even lifts of 6 inches (compacted thickness) uniformly around the structure.

B. Common fill may be used in areas beyond those designated for select fill unless shown or specified otherwise. Place and compact common fill in even lifts having a maximum thickness (measured before compaction) of 12 inches.

C. Fill required beneath building slabs or slabs on grade (except sidewalks) shall be select backfill, or as shown on the Plans. Place and compact structural fill in even lifts of 6 inches (compacted thickness).as specified on the plans. On-site material considered for use as select fill beneath building slabs may be submitted to the Engineer for review but shall not imply any obligation of the Engineer to accept it for use in the Work.

3.06 EMBANKMENT FILL PROCEDURES

A. Prior to placing embankment fill materials, remove all organic materials (including peat and loam) and loose inorganic silt material (loess) from areas beneath the proposed embankments. If the subgrade slopes are excessive, construct steps in the subgrade to produce a stable, horizontal surface for the placement of embankment materials. Scarify and recompact the existing subgrade to a depth of at least 6 inches before placing the first lift of embankment fill or as directed by the Engineer.

B. Embankment fill shall consist of common fill material, placed and compacted in even lifts of 12 inches (compacted thickness).

C. Rock may be used in embankment fill only with prior, written approval of the Engineer.

3.07 IMPERVIOUS FILL (NOT USED)

3.08 SOIL COMPACTION

A. Within 10 feet of structures: Compact the top 12 inches of existing subgrade and each layer of fill or backfill to a minimum of 95% standard proctor (ASTM D698) at or near its optimum moisture content.

B. Embankments (except under roadways), lawn and unimproved areas: Compact the top 6 inches of existing subgrade and each layer of fill or backfill to a minimum of 95% standard proctor (ASTM D698) at or near its optimum moisture content.

C. Beneath building slabs and slabs on grade (except sidewalks): Compact the top 12 inches of existing subgrade (and each layer of fill if applicable) to a minimum of 95% standard proctor (ASTM D698) at or near its optimum moisture content, or to the density specified on the Drawings.

D. Sidewalks: Compact the top 6 inches of existing subgrade (and each 6-inch layer of fill if applicable) to a minimum of 95% standard proctor (ASTM D698) at or near its optimum moisture content.

E. Roads, paved areas, and roadway embankments: Compact the top 12 inches of existing subgrade and each layer of fill or backfill to a minimum of 95% standard proctor (ASTM D698) at or near its optimum moisture content.

F. The moisture content of the material being compacted shall be within a range of two percent (2%) below the optimum to a maximum of two percent (2%) above. Adjust the moisture content of the material to maintain the range specified by the addition of water or by aeration.

3.09 DISPOSAL OF UNSUITABLE, WASTE AND/OR SURPLUS EXCAVATED MATERIAL

A. Remove and dispose of unsuitable, waste, and surplus excavated material off-site. Materials may be temporarily stockpiled in an area within the limits of construction that do not disrupt construction activities, create any nuisances or safety hazards, or otherwise restrict access to the site of the Work.

3.10 GRADING

B. Perform grading to the lines and grades shown on the Drawings. Remove all objectionable material encountered within the limits indicated and dispose of off-site. Provide complete and continuous drainage and dewatering of subgrades throughout the grading process. Install temporary drains, drainage ditches, etc., to intercept or divert surface water that may affect the execution or condition of grading work.

C. If at the time of grading it is not possible to place any material in its proper section of the Work, stockpile the fill material in approved areas for later use. No extra payment will be made for the stockpiling or double handling of excavated or borrow material.

D. Stones or rock fragments larger than 4 inches in their greatest dimensions will not be permitted within the top 6 inches of the finished grade of fills and embankments.

E. In cut areas, remove all loose or protruding rocks in slopes to the line or finished grade of the slope. Dress all cut and fill slopes in a uniform manner to the grade, cross-section and alignment shown on the Drawings unless otherwise directed by the Engineer.

3.11 FIELD TESTING

A. Prior to and during placement of backfill and embankment fill, coordinate with the soils testing laboratory to perform in-place soil density to verify the existing subgrade soil meets the requirements herein. Unless otherwise noted, conduct testing in accordance with the following minimum frequencies:

1. Determine a moisture-density relationship for each type of subgrade and backfill materials encountered, and conduct testing in accordance with AASHTO T 99 or T 180 (ASTM D698 or D1557)

2. Conduct field density and moisture testing of earthwork subgrade below all structures in accordance with AASHTO T 310 (ASTM D6938). Unless otherwise indicated, in-place density and moisture testing frequency shall be one (1) test per 2,500 square-feet of subgrade

3. Conduct field density and moisture testing of structural backfill in accordance with AASHTO T 310 (ASTM D6938). Unless otherwise indicated, in-place density and moisture testing frequency shall be one (1) test per 3,000 square-feet of area in each lift of embankment

3.12 RIPRAP AND SLOPE STABILIZATION

B. See Section 02375, Riprap.

END OF SECTION

SECTION 02370

EROSION AND SEDIMENTATION CONTROL

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment, and incidentals; and install, maintain, remove, and clean up erosion and sedimentation controls as shown on the Drawings and as specified herein.

B. The work shall include installation of temporary access ways and staging areas, silt fences, ditch checks, sediment removal and disposal, erosion control device maintenance, removal of temporary erosion control devices, temporary mulching, erosion control blanket installation, and final cleanup.

C. The Drawings include typical erosion and sedimentation control details for the Contractor's convenience and do not relieve him from installing different or additional devices within the guidelines where required to properly protect the site.

D. For construction sites in Arkansas with more than five (5) acres disturbed by construction activity, the Owner will file a Notice of Intent (NOI) for Discharges of Storm Water Associated with Large Construction Activity authorized under NPDES Permit No. ARR150000 with the Arkansas Division of Environmental Quality (DEQ). The Contractor shall post and maintain a Notice of Coverage (NOC) in a prominent location at the construction site for public viewing before commencement of construction.

E. The Owner has prepared a Storm Water Pollution Prevention Plan (SWP3) for use on this Project. The Contractor agrees to become a signatory to the SWP3. The Contractor further agrees to abide by the conditions of the SWP3, furnish and install all features of the SWP3, and amend the SWP3 as necessary to accommodate site conditions and construction elements.

F. For construction sites in Arkansas, the Owner will submit to DEQ the Notice of Termination for Dischargers of Storm Water Runoff Associated With Construction Activity authorized under NPDES General Permit ARR150000 following final stabilization of the construction site.

1.02 MATERIALS COMPLIANCE WITH AIS

A. P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), includes an "American Iron and Steel (AIS)" requirement in section 436 that requires Clean Water State Revolving Loan Fund (CWSRF) and Drinking Water State Revolving Loan Fund (DWSRF) assistance recipients to use iron and steel products that are produced in the United States for projects for the construction, alteration, maintenance, or repair of a public water system or treatment works. This Project meets the definition of such work, and the Environment Protection Agency (EPA) implementation requirements for this AIS requirement are outlined within the DWSRF memorandum titled "Implementation of

American Iron and Steel provisions of P.L. 113-76, Consolidated Appropriations Act, 2014" included as part of the RLF Supplemental General Conditions.

B. All parties are required to comply with these requirements and to ensure that all qualifying iron and steel products used in this project must be produced in the United States. See RLF Supplemental General Conditions for additional details.

1.03 RELATED SECTIONS

A. Section 01300 – Submittals

B. Section 01562 – Dust Control

C. Section 02100 – Site Preparation

D. Section 02140 – Dewatering and Drainage

E. Section 02200 – Earthwork

F. Section 02315 – Excavation, Trenching and Backfilling

G. Section 02501 – Pavement and Drainage Improvements

H. Section 02920 – Seeding

1.04 REFERENCE STANDARDS

A. Arkansas Department of Transportation (ARDOT) – Standard Specifications for Highway Construction, latest edition.

1.05 DEFINITIONS

A. Best Management Practices (BMPs): Schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of waters of the State. BMPs also include treatment requirements, operating procedures, and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

1.06 SUBMITTALS

A. See Section 01300, Submittals, for submittal procedures.

B. For all construction projects involving sites of one (1) acre or greater the Contractor shall:

1. Prior to the start of construction, submit a schedule for installing temporary and permanent erosion control work. Work shall not commence until the Engineer approves the erosion control schedule and methods of operation.

2. Sign and return three (3) copies of the SWP3 to the Engineer. Designate a qualified inspector responsible for performing inspections as specified in the SWP3.

3. Submit any amendments as necessary to the SWP3 to prevent sediment from leaving the construction site.

1.07 QUALITY ASSURANCE

A. Install and maintain all sedimentation control devices, including accepted Best Management Practices (BMPs), necessary to prevent the movement of sediment from the construction site to off-site areas or into the stream system via surface runoff or underground drainage systems. Install measures in addition to those shown on the Drawings as necessary to prevent the movement of sediment off-site and as directed by the Engineer. Maintain, remove and clean up sedimentation devices at no additional cost to the Owner.

B. Sedimentation and erosion control measures shall conform to the requirements of the SWP3.

1.08 REGULATORY REQUIREMENTS

A. Implement the SWP3 according to the requirements of the General Permit.

B. Do not discharge pollutants such as chemicals, fuels, lubricants, asphalt, raw sewage, concrete drum wash water, and other harmful waste into or alongside any waters of the United States. Dispose of these pollutants in accordance with governing State and Federal regulations and in accordance with the SWP3 and the General Permit.

1.09 COORDINATION

A. Coordinate the work of this Section with the work of other sections. Verify at the site both the dimensions and work of other trades adjoining items of work in this Section before commencement of items herein specified.

B. Furnish to the pertinent trades all items included under this Section that are to be built into the work of other sections.

1.10 FIELD MEASUREMENTS

A. Take field measurements at the site to verify or supplement indicated dimensions and to ensure proper coordination of all other construction items.

PART 2 PRODUCTS

2.01 MATERIALS

A. Crushed stone for sediment filtration devices, driveway and access ways, and staging areas: Hard, durable, crushed stone, 1 1/2-inch to 6-inch conforming to the ARDOT Standard Specification for Stone Backfill.

B. Rock ditch check riprap: Sound, durable rock, roughly rectangular in shape conforming to following:

1. Well graded within the following limits.

Weight of Stone	Percent Finer by Weight
40 lbs	100%
12 lbs	50%
3 lbs	0%

2. Free of rounded stones, boulders, sandstone, or similar soft stone.

3. Free of overburden, spoil, shale and organic material.

C. Silt fence: Prefabricated commercial product made of woven polypropylene, ultraviolet resistant material similar to Mirafi Silt Fence by TenCate Mirafi, Inc. or approved equal.

D. Straw mulch: Threshed straw of oats, wheat, barley, or rye, free of noxious weeds, mold, or other objectionable material. Straw mulch shall contain at least 50% by weight of material that is 10-inch or longer. Provide straw in an air-dry condition, suitable for placement with blower equipment.

E. Erosion control blanket: 100% agricultural straw matrix, stitch bonded with degradable thread against biodegradable jute netting, similar to AEC Premier Straw single net fiber by American Excelsior Company or approved equal.

F. Straw wattles: 100% agricultural straw matrix free of noxious weeds, mold, or other objectionable materials, bound in a 100% biodegradable wrap similar to Filtrexx BioWattle or approved equal.

PART 3 EXECUTION

3.01 GENERAL

A. Comply with the requirements of the Federal Clean Water Act; the Arkansas Water and Air Pollution Control Act 472, as amended; and the regulations, orders, or decrees issued pursuant thereto. In case of conflict between these regulations, orders, or decrees and the provisions shown on the construction plans, the more restrictive requirements shall apply.

B. The National Pollutant Discharge Elimination System (NPDES) requires permit coverage in order to discharge storm water associated with construction sites into waters of the United States. This coverage within Arkansas is obtained under DEQ General Permit ARR150000.

C. The Owner will file a Notice of Intent (NOI) and develop a Storm Water Pollution Prevention Plan (SWP3) for construction sites of five (5) acres or greater. The Contractor shall Implement the SWP3 according to the requirements of the General Permit and be prepared to install, construct, repair, and maintain erosion and sedimentation control items throughout the contract period. When the project site is stabilized per the

requirements of the NPDES General Permit, the Contractor shall provide written notice to the Owner. Once the site is deemed stabilized, the Owner will file the required Notice of Termination (NOT).

D. Operations performed by the Contractor on lands located outside the proposed areas of disturbance or project limits such as borrow pits, plant sites, waste sites or other facilities, may require separate coverage under NPDES permit and shall be the responsibility of the Contractor.

E. If the Contractor fails to properly maintain, install, or construct erosion and sedimentation control items, the Owner may take the following actions: cessation of the Work, withholding of Contractor payments, suspension of the project, or default of the Contractor.

F. Additional erosion and sedimentation control work required due to Contractor negligence, carelessness, or failure to install permanent controls as scheduled, shall be performed by the Contractor at no additional cost to the Owner. In addition, the Contractor may be assessed damages resulting from negligence in complying with the SWP3 at the rate assessed against the Owner by the permitting authority.

G. The work and measures associated with erosion and sedimentation control shall include but not be limited to the following best management practices (BMPs).

1. Staging of Earthwork Activities: Schedule excavation and moving of soil materials so that the smallest possible areas will be unprotected and subject to possible erosion for the shortest time feasible.

2. Seeding: Apply seed and fertilizer and establish a stand of grass to protect disturbed areas in accordance with Section 02920, Seeding.

3. Mulching: Apply mulch to provide temporary protection to soil surfaces from erosion.

4. Solid Sod: Install no-net solid Bermuda sod as needed for temporary erosion control.

5. Diversions: Grade ditches to divert water away from work areas and/or to collect runoff from work areas for treatment and safe disposal.

6. Stream Crossings: Install culverts or bridges where equipment must cross streams.

7. Sediment Basins: Construct sediment basins to settle and filter out sediment from eroding areas to protect properties and streams below the construction site.

8. Baled Straw Filter Barriers: Install temporary baled straw filter barriers to protect drainage inlets and junction boxes and trap sediment in ditches from areas of limited runoff. Remove bales when permanent measures are installed.

9. Waterways: Utilize waterways for the safe disposal of filtered runoff from fields, diversions and other structures or measures.

H. Install and monitor a rain gauge on the construction site. Maintain a daily record of rainfall amounts.

I. Maintain a signed copy of the SWP3 at the jobsite throughout the contract period.

3.02 INSTALLATION

A. Install silt fences as shown on the Drawings and in accordance with the manufacturer's recommendations. Position silt fences to prevent offsite movement of sediment produced by construction activities.

B. Install straw wattles crossing steeply sloped areas. Install in trenches that are at least 2 inches deep and take down the wattles with less than 4 feet between each stake.

C. Install baled straw filter barriers surrounded by silt fence around drainage inlets and junction boxes as shown on the Drawings and prior to setting the access casting.

D. Install rock ditch checks across stream and drainage channels just below a sandbag wall and as shown on the Drawings.

E. Install stabilized construction entrances with 6 inches (minimum) of crushed stone as shown on the Drawings.

F. Install 4 inches (minimum) crushed stone surface on staging areas and other access ways as shown on the Drawings.

G. The above requirements shall be in place prior to the initiation of construction activities.

3.03 MAINTENANCE AND INSPECTIONS

A. Inspections

1. Visually inspect all erosion and sedimentation control devices in accordance with the SWP3 and promptly after every 1/2-inch or greater rainstorm. If such inspection reveals that additional measures are needed to prevent movement of sediment to off-site areas, promptly install additional devices as needed and note any corrective measures on the inspection form in the SWP3.

2. Promptly repair sediment controls in need of maintenance within the time frame established in the SWP3.

B. Device Maintenance

1. Silt Fences

a. Remove accumulated sediment once it builds up to 50% of the height of the fabric

b. Replace damaged fabric, or patch with a 2-foot minimum overlap

c. Make other repairs as necessary to ensure that the fence is filtering all runoff directed to the fence

2. Straw Wattles

    a. Remove accumulated sediment once it builds up to 30% of the height of the roll

    b. Repair or replace split, torn, unraveled, or slumping wattles

3. Rock Ditch Check

    a. Muck out trapped silt from dewatering operations when it has built up to within 6 inches of the top of the berm

    b. Replace crushed stone filter when saturated with silt

4. Add crushed stone to driveway entrances, access ways, and staging areas as necessary to maintain a firm surface free of ruts and mudholes.

3.04 TEMPORARY MULCHING

A. Apply temporary mulch and seed to areas where rough grading has been completed but final grading is not anticipated to begin within 14 days of the completion of rough grading.

B. Apply straw mulch at the rate of 100 lbs/1,000 square feet and tackify with latex acrylic copolymer at a rate and diluted in a ratio per manufacturer’s instructions.

3.05 EROSION CONTROL BLANKETS

A. Install erosion control blankets in all seeded drainage swales and ditches as shown on the Drawings and as directed by the Engineer in accordance with manufacturer's instructions. Finish grade, fertilize and seed the area before the blanket is applied.

B. Unroll the blanket such that the netting is on top and the fibers in contact with the soil over the entire area. Lap the blankets in the direction of water flow and staple. Place blankets in a minimum of three rows wide (4 feet each for a total width of 12 feet) within the drainage swale/ditch and staple together in accordance with manufacturer's instructions. Overlap blanket side edges a minimum of 4 inches.

C. To secure the blankets, install staples made of wire, 0.091-inch in diameter or greater, "U" shaped with legs 10 inches in length, and with a 1 1/2-inch crown. Commercial biodegradable stakes may also be used with prior approval by the Engineer. Drive the staples vertically into the ground, spaced approximately 2 linear feet apart, on each side of the blanket, and one (1) row in the center alternately spaced between each side.

D. Bury the upper and lower ends of the matting to a depth of 4 inches in a trench. Create erosion stops every 25 feet by making a fold in the fabric and carrying the fold into a slit trench across the full width of the blanket. The bottom of the fold shall be 4 inches below the ground surface. Staple on both sides of the fold.

E. Where the matting must be cut or more than one roll length is required in the swale, turn down upper end of downstream roll into a slit trench to a depth of 4 inches. Overlap the lower end of the upstream roll 4 inches past the edge of the downstream roll and staple.

F. To ensure full contact with soil surface, roll matting with a roller weighing 100 lbs/ft. of width perpendicular to flow direction after seeding, mat placement, and stapling. Thoroughly inspect channel after completion. Correct any areas where matting does not present a smooth surface in full contact with the soil below.

3.06 SPILL PREVENTION

A. In the event that spills occur that are the direct result of the Contractor's actions or negligence, the cleanup and reporting of the spill shall be performed by the Contractor at no cost to the Owner.

1. Petroleum Products: Monitor all on-site vehicles for leaks and provide regular preventative maintenance to vehicles and equipment to reduce the chance of petroleum leakage on the project site. Store petroleum products in tightly sealed containers that are clearly labeled. Apply all asphalt substances according to the manufacturer's recommendations and/or these specifications.

2. Fertilizers: Apply fertilizers only in the manner and amounts required by the specifications. Store materials in a covered area and do not expose to precipitation. Remove and dispose of partially used fertilizer bags properly.

3. Paints and Solvents: Store all paint and solvent in tightly sealed containers when not required for use. Remove and dispose of excess material and waste according to the manufacturer's instructions and/or State and Federal Regulations.

4. Concrete Trucks: Direct concrete trucks to discharge surplus concrete or drum wash water on site only in concrete washout areas designated on the construction plans or SWP3.

5. Concrete Curing Agents: Apply concrete curing agents only in the manner and amount required by the specifications. Do not allow excess material to run off the areas being treated.

6. Off-site Sediment Control: Minimize off-site sediment transportation by limiting vehicle tracking and dust generation. The development and implementation of a dust control plan and off-site vehicle tracking plan will be the responsibility of the Contractor and shall be in accordance with the specifications.

3.07 REMOVAL AND FINAL CLEANUP

A. Once the site has been fully stabilized against erosion, remove sediment control devices and all accumulated silt. Dispose of silt and waste materials in a proper manner. Regrade all areas disturbed during this process and stabilize against erosion with surfacing materials as indicated on the Drawings.

B. Provide written notice to the Owner that the site has been stabilized in accordance with the SWP3 and the General Permit prior to removing temporary sediment control devices.

3.08 MAINTENANCE, REMOVAL AND RESTORATION

A. Maintain all pollution control measures and works in a functional condition as long as needed during the construction operation. Remove all temporary measures and restore the site to as nearly original conditions as practicable.

3.09 MEASUREMENT AND PAYMENT

A. Measurement and payment for erosion and sedimentation control will be specified in the bid documents. If no method of payment is specifically included in the bid proposal, all work associated with Erosion and Sedimentation Control will be considered incidental to the Work and will not be paid for separately.

END OF SECTION

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SECTION 02375

RIPRAP

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, tools, and equipment necessary to place a protective covering of stone riprap for erosion control or channel lining as shown on the Drawings.

1.02 MATERIALS COMPLIANCE WITH AIS

A. P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), includes an “American Iron and Steel (AIS)” requirement in section 436 that requires Clean Water State Revolving Loan Fund (CWSRF) and Drinking Water State Revolving Loan Fund (DWSRF) assistance recipients to use iron and steel products that are produced in the United States for projects for the construction, alteration, maintenance, or repair of a public water system or treatment works. This Project meets the definition of such work, and the Environment Protection Agency (EPA) implementation requirements for this AIS requirement are outlined within the DWSRF memorandum titled “Implementation of American Iron and Steel provisions of P.L. 113-76, Consolidated Appropriations Act, 2014” included as part of the RLF Supplemental General Conditions.

B. All parties are required to comply with these requirements and to ensure that all qualifying iron and steel products used in this project must be produced in the United States. See RLF Supplemental General Conditions for additional details.

1.03 RELATED SECTIONS

A. Section 01300 – Submittals

B. Section 02200 – Earthwork

C. Section 02370 – Erosion and Sedimentation Control

1.04 REFERENCE STANDARDS

A. American Association of State Highway and Transportation Officials (AASHTO), latest edition:

1. AASHTO M 288 Standard Specification for Geotextile Specification for Highway Applications

B. ASTM International (ASTM), latest edition:

1. ASTM D4355 Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus

2. ASTM D4491 Standard Test Method for Water Permeability of Geotextiles by Permittivity

3. ASTM D4533 Standard Test Method for Trapezoid Tearing Strength of Geotextiles

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

5. ASTM D4751 Standard Test Method for Determining Apparent Opening Size of Geotextile

6. ASTM D5199 Standard Test Method for Measuring the Nominal Thickness of Geosynthetics

7. ASTM D5261 Standard Test Method for Measuring Mass per Unit Area of Geotextiles

8. ASTM D5519 Standard Test Method for Particle Size Analysis of Natural and Man-Made Riprap Materials

9. ASTM D6241 Standard Test Method for Static Puncture Strength of Geotextiles and Geotextile-Related Products Using a 50-mm Probe

10. ASTM D6473 Standard Test Method for Specific Gravity and Absorption of Rock For Erosion Control

C. U.S. Army Corps of Engineers Standard (USACE), latest edition:

1. CRD C144 Standard Test Method for Resistance of Rock to Freezing and Thawing

1.05 SUBMITTALS

A. See Section 01300, Submittals, for submittal procedures.

B. When required by the Engineer, submit testing certificates from a qualified testing laboratory prior to acceptance of the rock source to verify the conformity to the requirements of this Section. The Engineer will consider allowing riprap material approved by ARDOT in lieu of requiring the Corps of Engineers testing for freeze/thaw resistance, as long as the material meets all other specified requirements.

C. Submit manufacturer's data for filter fabric demonstrating compliance with specified material properties, and including manufacturer's recommendations for storage, handling, installation, and anchoring fabric.

1.06 QUALITY ASSURANCE

A. Provide a 2-cubic-yard sample of riprap to the job site for the Engineer's inspection and approval.

B. When required by the Engineer, furnish supplier certifications for all materials from offsite sources for the following:

1. Determine bulk specific gravity and absorption of the stone in accordance with ASTM D6473. Ensure that the bulk specific gravity is at least 2.25, and the maximum absorption is six percent (6%).

2. Conduct soundness testing in accordance with USACE CRD C144 and ensure that the loss of soundness after 20 cycles is no greater than 15 percent (15%).

PART 2 PRODUCTS

2.01 RIPRAP STONE

A. Dumped Riprap: Stone shall be sandstone or limestone and shall be hard, sound and durable. It shall be reasonably free of fines and well graded between the maximum and minimum rock sizes so as to produce a minimum of voids. The maximum stone size shall not be greater than 18 inches in any dimension, and approximately 50 percent (50%) of the rock shall consist of pieces weighing 35 pounds or more.

B. Dumped Riprap (Grouted): Stone for grouted riprap shall met the requirements for dumped riprap as described above, except that the pieces shall range in size from approximately 12 inches to 24 inches in any dimension, with the interstices filled with stone spalls and grouted with cement grout.

2.02 GROUT

A. Grout Filler shall be composed of a mixture of one (1) part Portland cement and three (3) parts sand, mixed with water to produce a workable consistency. The amount of water used shall be approved by the Engineer.

2.03 FILTER FABRIC

A. Filter Fabric for Riprap: A woven or nonwoven synthetic fiber geotextile conforming to the requirements in Table 1 below; similar to Mirafi 140N manufactured by TenCate Geosynthetics, or approved equal.

Table 1
Filter Fabric for Riprap

Fabric Properties	ASTM Test Method	Unit	Minimum Value
Weight per Unit Area	D5261	oz/yd^2	4.4
Thickness	D5199	mils	55
Tensile Strength (MD & TD)*	D4632	lb	120
Tensile Elongation (MD & TD)*	D4632	%	50
Trapezoid Tear Strength	D4533	lb	50
CBR Puncture Strength	D6241	lb	310
Apparent Opening Size (AOS)**	D4751	U.S. Sieve	70
Permittivity	D4491	sec^{-1}	1.7
UV Resistance (at 500 hours)	D4355	% strength retained	70

* Machine Direction (MD), Transverse or Cross Direction (TD)

**ASTM D4751, AOS is a maximum opening diameter value

PART 3 EXECUTION

3.01 CONSTRUCTION

A. Prepare the subgrade to the lines, slopes and evaluations indicated. Clear the subgrade of sticks, stones, debris, and other materials that could puncture the overlying filter fabric. The finished subgrade shall not vary from design grade by more than 2 inches at any location.

B. Complete foundation or toe trenches and other necessary excavation to the satisfaction of the Engineer before placing riprap. Slopes to be protected with riprap shall be free of brush, trees, stumps, and other objectionable material and shall be dressed to a reasonably smooth surface.

3.02 FILTER FABRIC

A. Place filter fabric directly on the prepared surface. Fabric sections may be placed vertically or horizontally on the slope. Join adjacent fabric sections by overlapping a minimum of 2 feet at the edges and pinning the overlapped strip with U-shaped wire pins or similar fasteners. Insert fasteners through both strips of overlapped fabric at increments of approximately 4 feet along the overlap. Install additional pins as necessary to prevent displacement of the fabric.

B. Overlap fabric in the direction of water flow. Turn down the fabric and bury approximately 12 inches at the exterior limits.

C. No construction equipment will be permitted directly on the fabric.

3.03 RIPRAP

A. Place riprap to the thickness, height and length shown on the Drawings. The larger stones shall be well distributed, and the finished riprap shall be free of objectionable pockets of small stones. Riprap may be placed by dumping or by machine provided proper distribution of material is achieved. Hand placing may be required, but only to the extent necessary to secure the results specified. Placing riprap by dumping into chutes or other methods likely to cause segregation will not be permitted.

B. Fill undesirable voids with small stones or spalls. Manipulate the rock sufficiently by means of a bulldozer, excavator, rock tongs, or other suitable equipment to secure a reasonably regular surface and mass stability.

C. Riprap stone shall not be deposited in a manner that will cause damage to the filter fabric. Any damage to fabric during placement of riprap shall be corrected by the Contractor at no cost to the Owner. Damaged fabric shall be repaired or replaced as directed by the Engineer.

D. When placed in conjunction with the construction of the embankment, provide a sufficient lag in construction of the riprap protection as may be necessary to place filter cloth and to prevent mixture of embankment and riprap material.

E. Provide a level, compact area of sufficient size to dump and sort typical loads of riprap at an approved location. Provide mechanical equipment as needed to sort the riprap at no additional cost to the Owner.

3.04 GROUTED RIPRAP

A. Place riprap as described in Paragraph 3.03 above. Thoroughly wet the stone immediately prior to applying the grout. Work the grout into the voids by rodding or with a vibrator as the grout is deposited on the riprap. Finish the grouted riprap by brushing to expose the top surfaces.

3.05 RIPRAP AND SLOPE STABILIZATION

A. Prior to installation of riprap, install geosynthetic filter fabric on properly prepared slopes in accordance with the manufacturer’s instructions. Fold fabric at the ends and sides and staple. Place fabric a minimum of three (3) rows (of 4 feet) wide (total 12 feet) and staple together in accordance with the manufacturer’s instructions. Drive staples vertically into the ground, spaced approximately 5 feet apart, on each side and one (1) row in the center alternately spaced on each side. Overlap adjoining rows in the downslope or downstream direction and secure with a common row of staples.

B. Place riprap in conjunction with the construction of embankment with only sufficient lag in the riprap construction as may be necessary to allow for proper construction of the embankment and to prevent mixture of embankment material and riprap material.

C. Hand place riprap (do not dump) on the compacted embankment. Lay stones so that the maximum dimension is perpendicular to the bed. Place stones so that the weight of each stone is carried by the underlying material and not by adjacent stones. Place large stones at the bottom of the slope. Fill the spaces between stones with spalls or smaller stones of suitable size to construct a solid, stable slope, free from large voids and defects that might not protect the embankment against erosion.

END OF SECTION

SECTION 02419

ARCHITECTURAL SELECTIVE DEMOLITION

PART 1 GENERAL

1.01 SCOPE OF WORK

A. This Section requires the selective removal and subsequent off-site disposal of the following:

1. Portions of existing building indicated on drawings and as required to accommodate new construction.

2. Removal of roofs, walls, ceiling, doors, frames, stairs and other existing construction as shown on architectural drawings.

3. Removal and protection of existing fixtures, materials, and equipment items indicated.

1.02 MATERIALS COMPLIANCE WITH AIS

A. P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), includes an “American Iron and Steel (AIS)” requirement in section 436 that requires Clean Water State Revolving Loan Fund (CWSRF) and Drinking Water State Revolving Loan Fund (DWSRF) assistance recipients to use iron and steel products that are produced in the United States for projects for the construction, alteration, maintenance, or repair of a public water system or treatment works. This Project meets the definition of such work, and the Environment Protection Agency (EPA) implementation requirements for this AIS requirement are outlined within the DWSRF memorandum titled “Implementation of American Iron and Steel provisions of P.L. 113-76, Consolidated Appropriations Act, 2014” included as part of the RLF Supplemental General Conditions.

B. All parties are required to comply with these requirements and to ensure that all qualifying iron and steel products used in this project must be produced in the United States. See RLF Supplemental General Conditions for additional details.

1.03 RELATED SECTIONS

A. Relocation of pipes, conduits, ducts, and other mechanical and electrical work is specified in other Sections.

1.04 JOB CONDITIONS

A. Condition of Structure: Owner assumes no responsibility for actual condition of items or structures to be demolished.

1. Conditions existing at time of inspection for bidding purposes will be maintained by Owner insofar as practicable. However, minor variations within structure may occur by Owner's removal/salvage operations prior to start of selective demolition work.

2. The contractor shall field measure the existing structure to determine required material lengths and verify that the condition of the existing structure is as implied on the drawings before the fabrication of any items. Any existing items which are in conflict with details shown on the drawing shall be brought to the Architect’s attention immediately.

B. Partial Demolition and Removal: Items indicated to be removed but of salvageable value to Contractor may be removed from structure as work progresses. Transport salvaged items from site as they are removed.

1. Storage or sale of removed items on site will not be permitted.

2. Items noted to be delivered to Owner for storage shall remain property of the Owner.

3. Items noted to be removed, stored and reinstalled shall be so done at Contractor’s expense. Contractor assumes total responsibility for replacement of all items in a condition equal to their condition at the start of construction. Any item damaged by the Contractor shall be replaced with a new item of equal quality.

C. Protections: Provide temporary barricades and other forms of protection to protect Owner's personnel and general public from injury due to selective demolition work.

1. Protect from damage existing finish work that is to remain in place and becomes exposed during demolition operations.

2. Protect floors with suitable coverings when necessary.

3. Provide temporary weather protection during interval between demolition and removal of existing construction on exterior surfaces and installation of new construction to ensure that no water leakage or damage occurs to structure or interior areas of existing building.

4. Remove protections at completion of work.

5. Provide temporary construction shown to maintain egress required by the Building Code during construction of the new building. Remove all temporary construction and restore to its existing conditions areas so shown.

D. Damages: Promptly repair damages caused to adjacent facilities by demolition work.

E. Flame Cutting: Do not use cutting torches for removal until work area is cleared of flammable materials. At concealed spaces, such as interior of ducts and pipe spaces, verify condition of hidden space before starting flame-cutting operations. Maintain portable fire suppression devices during flame-cutting operations.

F. Utility Services: Maintain existing utilities indicated to remain in service and protect them against damage during demolition operations.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 PREPARATION

A. Cover and protect equipment and fixtures from soilage or damage when demolition work is performed in areas where such items have not been removed.

B. Locate, identify, stub off, and disconnect utility services that are not indicated to remain.

3.02 DEMOLITION

A. General: Perform selective demolition work in a systematic manner. Use such methods as required to complete work indicated on Drawings in accordance with demolition schedule and governing regulations.

1. Demolish concrete and masonry in small sections. Cut concrete and masonry at junctures with construction to remain using power-driven masonry saw or hand tools; do not use power-driven impact tools.

2. Locate demolition equipment throughout structure and promptly remove debris to avoid imposing excessive loads on supporting walls, floors, or framing.

3. Provide services for effective air and water pollution controls as required by local authorities having jurisdiction.

B. If unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure both nature and extent of the conflict. Submit report to Architect in written, accurate detail. Pending receipt of directive from Architects, rearrange selective demolition schedule as necessary to continue overall job progress without undue delay.

3.03 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove from building site debris, rubbish, and other materials resulting from demolition operations. Transport and legally dispose off site.

1. If hazardous materials are encountered during demolition operations, comply with applicable regulations, laws, and ordinances concerning removal, handling, and protection against exposure or environmental pollution.

3.04 CLEANUP AND REPAIR

A. General: Upon completion of demolition work, remove tools, equipment, and demolished materials from site. Remove protections and leave interior areas broom clean.

1. Repair demolition performed in excess of that required. Return elements of construction and surfaces to remain to condition existing prior to start operations. Repair adjacent construction or surfaces soiled or damaged by selective demolition work.

END OF SECTION

SECTION 02469

DRILLED MICROPILES

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The work includes constructing micropiles as shown on the Drawings and as specified herein. The Contractor is responsible for furnishing of all design, materials, products, accessories, tools, equipment, services, transportation, labor and supervision, and manufacturing techniques required for design, installation and testing of micropiles and pile top attachments for this project.

B. The selected micropile specialty Subcontractor shall select the micropile type, size, installation means and methods, estimate the ground-grout bond value and determine the required bond length and final micropile diameter. The micropile specialty Subcontractor shall design and install rnicropiles that will develop the load capacities indicated on the plans. The micropile load capacities shall be verified by verification and proof load testing as required and must meet the test acceptance criteria specified herein.

1.02 MATERIALS COMPLIANCE WITH AIS

A. P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), includes an “American Iron and Steel (AIS)” requirement in section 436 that requires Clean Water State Revolving Loan Fund (CWSRF) and Drinking Water State Revolving Loan Fund (DWSRF) assistance recipients to use iron and steel products that are produced in the United States for projects for the construction, alteration, maintenance, or repair of a public water system or treatment works. This Project meets the definition of such work, and the Environment Protection Agency (EPA) implementation requirements for this AIS requirement are outlined within the DWSRF memorandum titled “Implementation of American Iron and Steel provisions of P.L. 113-76, Consolidated Appropriations Act, 2014” included as part of the RLF Supplemental General Conditions.

B. All parties are required to comply with these requirements and to ensure that all qualifying iron and steel products used in this project must be produced in the United States. See RLF Supplemental General Conditions for additional details.

1.03 RELATED SECTIONS

A. Section 01450 – Field Quality Control

B. Section 02200 – Earthwork

C. Section 02315 – Excavation Trenching and Backfilling

D. Section 02316 – Structural Excavation, Backfilling and Grading

E. Section 03740 – Modification or Repair of Existing Concrete

1.04 DEFINITIONS

A. Admixture for Grout: Substance added to the grout to control bleed and/or shrinkage, improve flowability, reduce water content, or retard setting time.

B. Alignment Load (AL): A minimum initial load (5 percent DL maximum) applied to micropile during testing to keep the testing equipment correctly positioned.

C. Bonded Length: The length of the micropile that is bonded to the ground and conceptually used to transfer the applied axial loads to the surrounding soil or rock. Also known as the load transfer length.

D. Casing: Steel tube introduced during the drilling process in overburden soil to temporarily stabilize the drill hole. This is usually withdrawn as the pile is grouted, although in certain types of micropiles, some casing is permanently left in place to provide added pile reinforcement.

E. Centralizer: A device to support and position the reinforcing steel in the drill hole and/or casing so that a minimum grout cover is provided.

F. Creep Movement: The movement that occurs during the creep test of a micropile under a constant load.

G. Design Load (DL): The maximum unfactored load expected to be applied to the micropile during its service life.

H. Micropile: A small-diameter, bored, cast-in-place composite pile, in which the applied load is resisted by steel reinforcement, cement grout and frictional grout/ground bond.

I. Nominal Grout-to-Ground Bond Strength: The estimated ultimate geotechnical unit grout-to-ground bond strength selected for use in design. Same as a bond nominal strength (SLD and LFD).

J. Grout: Portland-cement-based grout injected into the micropile hole prior to or after the installation of the reinforcement to direct the load transfer to the surrounding ground along the micropile.

K. Proof Load Test: Incremental loading of a production micropile, recording the total movement at each increment.

L. Reinforcement: The steel component of the micropile that accepts and/or resists applied loading.

1.05 EXPERIENCE REQUIREMENTS

A. The micropile specialty Subcontractor shall be experienced in the construction and load testing of micropiles.

B. The micropile specialty Subcontractor shall have previous micropile drilling and grouting experience in soil/rock similar to project conditions.

C. The micropile specialty Subcontractor shall assign an engineer to supervise the work. The on-site foremen and drill rig operators shall also have experience installing micropiles.

D. The micropiles shall be designed by a Registered Professional Engineer with experience in the design of micropiles of similar capacity to those required in these plans and specifications. The micropile design engineer may be either an employee of the micropile Subcontractor or a separate Consultant design engineer.

E. The Contractor shall submit 5 copies of the completed project reference list and a personnel list. The project reference list shall include a brief project description with the owner's name and current phone number. The personnel list shall identify the micropile specialty Subcontractor's supervising project engineer, drill rig operators, and on-site foremen to be assigned to the project. The personnel list shall contain a summary of each individual's experience. The micropile specialty Subcontractor's qualifications will be reviewed in accordance with Section 01300, Submittals. Additional time required due to incomplete or unacceptable submittals will not be cause for time extension or impact or delay claims.

F. Work shall not be started, until the micropile specialty Subcontractor's experience qualification submittal is reviewed and accepted in writing by the Design Professional. Work may be suspended if the micropile specialty Subcontractor uses non-approved personnel. If work is suspended, the Contractor shall be fully liable for all resulting costs and no adjustment in contract time will result from the suspension.

1.06 REFERENCE STANDARDS

A. The following publications form a part of this specification to the extent indicated by the references. The latest publication as of the issue date of this specification shall govern, unless indicated otherwise.

B. ASTM International (ASTM), latest edition:

1. ASTM A36 Standard Specification for Carbon Structural Steel

2. ASTM A82 Standard Specification for Steel Wire, Plain, for Concrete Reinforcement

3. ASTM A252 Standard Specification for Welded and Seamless Steel Pipe Piles

4. ASTM A615 Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement

5. ASTM A722 Standard Specification for High-Strength Steel Bars for Prestressed Concrete

6. ASTM A755 Standard Specification for Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products

7. ASTM A934 Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars

8. ASTM C33 Standard Specification for Concrete Aggregates

9. ASTM C109 Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens)

10. ASTM C188 Standard Test Method for Density of Hydraulic Cement

11. ASTM C144 Standard Specification for Aggregate for Masonry Mortar

12. ASTM C150 Standard Specification for Portland Cement

13. ASTM C494 Standard Specification for Chemical Admixtures for Concrete

14. ASTM D1143 Standard Test Methods for Deep Foundation Elements Under Static Axial Compressive Load

15. ASTM D1784 Standard Classification System and Basis for Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds

16. ASTM D3350 Standard Specification for Polyethylene Plastics Pipe and Fittings Materials

17. ASTM D3689 Standard Test Methods for Deep Foundation Elements Under Static Axial Tensile Load

18. ASTM D3966 Standard Test Methods for Deep Foundations Under Lateral Load

C. American Welding Society (AWS), latest edition:

1. AWS D1.1 Structural Welding Code–Steel

2. AWS D1.4 Structural Welding Code–Reinforcing Steel

D. American Petroleum Institute (APi), latest edition:

1. 5CT (N-80) Specification for casing and tubing.

2. RP 13B-1 Recommended Practice – Standard Procedure for Field Testing Water Based Drilling Fluids

1.07 CONSTRUCTION SITE SURVEY

A. The Contractor and micropile specialty Subcontractor shall review the available subsurface information and visit the site to assess the general site conditions, site geometry, equipment access conditions, location of existing structures and above ground facilities.

B. The Contractor is responsible for field locating and verifying the location of all utilities shown on the Plans prior to starting the Work. Maintain uninterrupted service for those utilities designated to remain in service throughout the Work. Notify the Engineer of any utility locations different from those shown on the Plans that may require micropile relocations or structure design modification.

1.08 MICROPILE DESIGN REQUIREMENTS

A. The micropiles shall be designed to meet the specified loading conditions, as shown on the contract Plans and approved working drawings. Design the micropiles using the procedures contained in the FHWA "Micropile Design and Construction", Report No. FHWA NHI-05-039.

B. The required geotechnical factors of safety shall be in accordance with the FHWA manual, unless specified otherwise.

C. Structural design of any individual micropile structure elements not covered in the FHWA manual shall be by the service load design method in conformance with appropriate articles of the most current Edition of the AASHTO Standard Specifications for Highway Bridges, including current interim specifications.

D. Submit complete design calculations and working drawings to the Engineer for review and approval. Include all details, dimensions, quantites, ground profiles, and cross-sections necessary to construct the micropile structure. Verify the limits of the micropile structure and ground survey data before preparing the detailed working drawings.

E. The drawings and calculations shall be signed and sealed by the micropile specialty subcontractor's Professional Engineer or by the Consultant designer's Professional Engineer (if applicable), acceptable to the owner's Engineer. If the micropile subcontractor uses a consultant design engineer to prepare the design, the micropile contractor shall still have overall contract responsibility for both the design and the construction.

F. Design calculations shall include, but not be limited to the following items:

1. A written summary report which describes the overall micropile design

2. Applicable code requirements and design references

3. Micropile structure critical design cross-sections geometry including soil/rock strata

4. Design criteria including ground-grout bond values and micropile drillhole diameter assumptions for each soil/rock strata

5. Factors of safety and allowable stresses used in the design on the ground grout bond values, grout, and concrete materials

6. Design calculation sheets with the project number, micropile structure location, designation, date of preparation, initials of designer and checker, and page number at the top of each page

7. Design criteria including ground-grout bond values and micropile drillhole diameter assumptions for each soil/rock strata

1.09 SUBMITTALS

A. See Section 01300, Submittals for submittal procedures. Submit shop drawings and product data showing materials of construction and details of installation of micropiles.

B. Micropile specialty Subcontractor's experience qualifications.

C. Calculation package, Shop drawings including all details, dimensions, quantities, ground profiles, and cross-sections necessary to construct the micropile structure. Verify the limits of the micropile structure and ground survey data before preparing the detailed working drawings. Submit samples of each of the following items.

D. The shop drawings shall include all information required for the construction and quality control of the piling. Shop drawings shall include, but not be limited to, the following items:

1. A plan view of the micropile structure(s) identifying:

   a. A reference baseline and elevation datum

   b. The offset from the construction centerline or baseline to the face of the micropile structure at all changes in horizontal alignment

   c. Beginning and end of micropile stations

   d. Location of all known adjacent structures or other potential interferences. The centerline of any drainage structure or pipe behind, passing through, or passing under the micropile structure

2. An elevation view of the micropile structure(s) identifying:

   a. Elevation view showing micropile locations and elevations; vertical and horizontal spacing; batter and alignment and the location of drainage elements (if applicable)

   b. Existing and finish grade profiles both behind and in front of the micropile structure

3. Design parameters and applicable codes

4. General notes for constructing the micropile structure including construction sequencing or other special construction requirements

5. Horizontal and vertical curve data affecting the micropile structure and micropile structure control points. Match lines or other details to relate micropile structure stationing to centerline stationing

6. A listing of the summary of quantities on the elevation drawing of each micropile structure

7. Micropile typical sections including micropile spacing and inclination; minimum drillhole diameter; pipe casing and reinforcing bar sizes and details; splice types and locations; centralizers and spacers; grout bond zone and casing plunge lengths (if used); corrosion protection details; and connection details to the substructure footing, anchorage, plates, etc.

8. A typical detail of verification and production proof test micropiles defining the micropile length, minimum drillhole diameter, inclination, and load test bonded and unbonded test lengths

9. Details, dimensions, and schedules for all micropiles, casing and reinforcing steel, including reinforcing bar bending details

E. Detailed step-by-step description of the proposed micropile construction procedure, including personnel, testing and equipment to assure quality control. This step-by-step procedure shall be shown on shop drawings in sufficient detail to allow the Engineer to monitor the construction and quality of the micropiles.

F. Plan describing how surface water, drill flush, and excess waste grout will be controlled and disposed.

G. Certified mill test reports for the reinforcing steel or coupon test results for permanent casing without mill certification. The ultimate strength, yield strength, elongation, and material properties composition shall be included. For API N-80 pipe casing, coupon test results may be submitted in lieu of mill certification.

E. Welder's certification. The certification shall be in accordance with AWS D1.4 when welding of reinforcement is required

F. Proposed Grouting Plan. The grouting plan shall include complete descriptions, details, and supporting calculations for the following:

1. Grout mix design and type of materials to be used in the grout including certified test data and trial batch reports.

2. Methods and equipment for accurately monitoring and recording the grout depth, grout volume, and grout pressure as the grout is being placed.

3. Grouting rate calculations, when requested by the Design Professional. The calculations shall be based on the initial pump pressures or static head on the grout and losses throughout the placing system, including anticipated head of drilling fluid (if applicable) to be displaced.

4. Estimated curing time for grout to achieve specified strength. Previous test results for the proposed grout mix completed within one year of the start of grouting may be submitted for initial verification and acceptance and start of production work. During production, grout shall be tested as specified herein

5. Procedure and equipment for Subcontractor monitoring of grout quality.

G. Detailed plans for the proposed micropile load testing method. This shall include all drawings, details, and structural design calculations necessary to clearly describe the proposed test method, reaction load system capacity and equipment setup, types and accuracy of apparatus to be used for applying and measuring the test loads and pile top movements in accordance with Section 3.06 Micropile Testing

H. Calibration reports and data for each test jack, pressure gauge, and master pressure gauge and electronic load cell to be used. The calibration tests shall have been performed by an independent testing laboratory, and tests shall have been performed within 90 calendar days of the submittal date.

I. The Contractor will not be allowed to begin micropile structure construction or incorporate materials into the work until the submittal requirements are satisfied and found acceptable to the Design Professional. Changes or deviations from the approved submittals must be re- submitted for approval. No adjustments in contract time or delay or impact claims will be allowed due to incomplete submittals.

J. Revise the drawings when plan dimensions are changed due to field conditions or for other reasons. Within 30 days after completion of the work, submit as-built drawings to the Design Professional. Provide revised design calculations signed by the a Registered Professional Engineer for all design changes made during the construction of the micropile structure.

PART 2 PRODUCTS

2.01 MATERIALS

A. Materials shall be new and without defects. Remove defective materials from the jobsite at no additional costs.

B. Admixtures for Grout: Admixtures shall conform to the requirements of ASTM 494/AASHTO M194. Admixtures that control bleed, improve flowability, reduce water content, and retard set may be used in the grout, subject to the review and acceptance of the Engineer. Admixtures shall be compatible with the grout and mixed in accordance with the manufacturer's recommendations. Expansive admixtures shall only be added to the grout used for filling sealed encapsulations and anchorage covers. Accelerators are not permitted. Admixtures containing chlorides are not permitted.

C. Cement: All cement shall be Portland cement conforming to ASTM C 150/AASHTO M85, Types II, Ill or V.

D. Centralizers and Spacers: Centralizers and spacers shall be fabricated from schedule 40 PVC pipe or tube, steel, or material non-detrimental to the reinforcing steel. Wood shall not be used. Centralizers and spacers shall be securely attached to the reinforcement;

sized to position the reinforcement within 3/8 inch of plan location from center of pile; sized to allow grout tremie pipe insertion to the bottom of the drillhole; and sized to allow grout to freely flow up the drillhole and casing and between adjacent reinforcing bars.

E. Epoxy Coating: The minimum thickness of coating applied electrostatically to the reinforcing steel shall be 0.3 mm. Epoxy coating shall be in accordance with ASTM A775 or ASTM A934. Bend test requirements are waived. Bearing plates and nuts encased in the pile concrete footing need not be epoxy coated.

F. Fine Aggregate: If sand - cement grout is used, sand shall conform to ASTM C 144/AASHTO M45.

G. Grout: Neat cement or sand/cement mixture with a minimum 3-day compressive strength of 2000 psi and a 28-day compressive strength of 4000 psi per AASHTO T106/ASTM C109.

H. Grout Protection: Provide a minimum 1-inch grout cover over bare or epoxy coated bars (excluding bar couplers) or minimum ½ inch grout cover over the encapsulation of encapsulated bars.

I. Permanent Casing Pipe: Permanent steel casing/pipe shall have the diameter and at least minimum wall thickness as shown on the Plans. The permanent steel casing/pipe shall meet the Tensile Requirements of ASTM A252, Grade 3, except the yield strength shall be a minimum of 50 KSI.

J. For permanent casing/pipe that will be welded, the following material conditions apply:

1. The carbon equivalency (CE) as defined in AWS 01.1, Section X15.1, shall not exceed 0.45, as demonstrated by mill certifications.

2. The sulfur content shall not exceed 0.05%, as demonstrated by mill certifications.

K. For permanent casing/pipe that will be shop or field welded, the following fabrication or construction conditions apply:

1. The steel pipe shall not be joined by welded lap splicing.

2. Welded seams and splices shall be complete penetration welds.

3. Partial penetration welds may be restored in conformance with AWS D1.1.

4. The proposed welding procedure certified by a welding specialist shall be submitted for approval.

L. Plates and Shapes: Structural steel plates and shapes for pile top attachments shall conform to ASTM A 36/AASHTO M183, or ASTM A 572/AASHTO M223, Grade 50.

M. Reinforcing Bars: Reinforcing steel shall be deformed bars in accordance with ASTM A 615/AASHTO M31, Grade 60 or Grade 75 or ASTM A 722/AASHTO M275, Grade 150. When a bearing plate and nut are required to be threaded onto the top end of reinforcing bars for the pile top to footing anchorage, the threading may be continuous spiral

deformed ribbing provided by the bar deformations (e.g., Dywidag or Williams continuous thread bars).

PART 3 EXECUTION

3.01 SITE DRAINAGE CONTROL

A. The Contractor shall control and properly dispose of drill flush and construction related waste, including excess grout, in accordance with the standard specifications and all applicable local codes and regulations. Provide positive control and discharge of all surface water that will affect construction of the micropile installation. Maintain all pipes or conduits used to control surface water during construction. Repair damage caused by surface water at no additional cost to the owner. Upon substantial completion of the Work, remove surface water control pipes or conduits from the site. Contractor shall not allow any drill flush, excess grout, or any other construction related waste be deposited on bare ground, existing stormwater drainage or adjacent creek.

B. Immediately contact the Design Professional if unanticipated existing subsurface drainage structures are discovered during excavation or drilling. Suspend work in these areas until remedial measures are implemented.

3.02 EXCAVATION

A. Coordinate the work and the excavation so the micropile structures are safely constructed. Perform the micropile construction and related excavation in accordance with the Plans and Specifications.

3.03 MICROPILE CONSTRUCTION TOLERANCES

A. The micropile Subcontractor shall select the drilling method, the grouting procedure, and the grouting pressure used for the installation of the micropiles. The micropile Subcontractor is also responsible for estimating the grout take.

B. Drilling: The drilling equipment and methods shall be suitable for drilling through the condition to be encountered, without causing damage to any overlying or adjacent structures or services. The drillhole must be open along it's full length to at least the design minimum drillhole diameter prior to placing grout and reinforcement.

C. Temporary casing or other approved method of pile drillhole support will be required in caving or unstable ground to permit the pile shaft to be formed to the minimum design drillhole diameter. The Subcontractor's proposed method(s) to provide drillhole support and to prevent detrimental ground movements shall be reviewed by the Engineer. Detrimental ground movement is defined as movement which requires remedial repair measures. Use of drilling fluid containing Bentonite is not allowed.

D. Ground Heave or Subsidence: During construction, the Contractor shall observe the conditions in the vicinity of the micropile construction site on a daily basis for signs of ground heave or subsidence. Immediately notify the Engineer if signs of movements are observed. Contractor shall immediately suspend or modify drilling or grouting operations if ground heave or subsidence is observed, if the micropile structure is adversely affected, or if adjacent structures are damaged from the drilling or grouting. If the movements

require corrective action, the Contractor shall take corrective actions necessary to stop the movement or perform repairs. When due to the Contractor's methods or operations or failure to follow the specified/approved construction sequence, the costs of providing corrective actions will be borne by the Contractor.

E. Pipe Casing and Reinforcing Bars Placement and Splicing: Reinforcement may be placed either prior to grouting or placed into the grout - filled drillhole before temporary casing (if used) is withdrawn. Reinforcement surface shall be free of deleterious substances such as soil, mud, grease or oil that might contaminate the grout or coat the reinforcement and impair bond. Pile cages and reinforcement groups, if used, shall be sufficiently robust to withstand the installation and grouting process and the withdrawal of the drill casings without damage or disturbance.

F. The Contractor shall check pile top elevations and adjust all installed micropiles to the planned elevations.

G. Centralizers and spacers (if used) shall be provided at 10-foot centers maximum spacing with two minimum per micropile. The upper and lower most centralizer shall be located a maximum of 5 feet from the top and bottom of the micropile. Centralizers and spacers shall permit the free flow of grout without misalignment of the reinforcing bar(s) and permanent casing. The central reinforcement bars with centralizers shall be lowered into the stabilized drill hole and set. The reinforcing steel shall be inserted into the drill hole to the desired depth without difficulty. Partially inserted reinforcing bars shall not be driven or forced into the hole. Subcontractor shall redrill and reinsert reinforcing steel when necessary to facilitate insertion.

H. Lengths of casing and reinforcing bars to be spliced shall be secured in proper alignment and in a manner to avoid eccentricity or angle between the axes of the two lengths to be spliced. Splices and threaded joints shall meet the requirements of Materials Section 2.0. Threaded pipe casing joints shall be located at least two casing diameters (OD) from a splice in any reinforcing bar. When multiple bars are used, bar splices shall be staggered at least 1.0 foot.

I. Grouting: Micropiles shall be primary grouted the same day the load transfer bond length is drilled. The Subcontractor shall use a stable neat cement grout or a sand cement grout with a minimum 28-day unconfined compressive strength of 4000 psi. Admixtures, if used, shall be mixed in accordance with manufacturer's recommendations. The grouting equipment used shall produce a grout free of lumps and undispersed cement.

J. The Subcontractor shall have means and methods of measuring the grout quantity and pumping pressure during the grouting operations. The grout pump shall be equipped with a pressure gauge to monitor grout pressures. A second pressure gauge shall be placed at the point of injection into the pile top. The pressure gauges shall be capable of measuring pressures of at least 145 psi or twice the actual grout pressures used, whichever is greater. The grout shall be kept in agitation prior to mixing. Grout shall be placed within one hour of mixing. The grouting equipment shall be sized to enable each pile to be grouted in one continuous operation. The grout shall be injected from the lowest point of the drill hole and injection shall continue until uncontaminated grout flows from the top of the pile. The grout may be pumped through grout tubes, casing, hollow-stem augers, or drill rods. Temporary casing, if used, shall be extracted in stages ensuring that, after each length of casing is removed the grout level is brought back up to the

ground level before the next length is removed. The tremie pipe or casing shall always extend below the level of the existing grout in the drillhole. The grout pressures and grout takes shall be controlled to prevent excessive heave or fracturing of rock or soil formations. Upon completion of grouting, the grout tube may remain in the hole, but must be filled with grout.

K. If the Subcontractor elects to use a post grouting system, Shop Drawings and details shall be submitted to the Engineer for review in accordance with Section 1.08 Submittals.

3.04 MICROPILE INSTALLATION RECORD

A. The micropile specialty Subcontractor shall prepare and submit to the Design Professional full-length installation records for each micropile installed. The records shall be submitted within one work shift after that pile installation is completed. The data shall be recorded on a micropile installation log. A separate log shall be provided for each micropile.

3.05 GROUT TESTING

A. Grout Testing: Grout within the micropile verification and proof test piles shall attain the minimum required 3-day compressive strength of 2000 psi prior to load testing. During production, micropile grout shall be tested by the Contractor for compressive strength in accordance with AASHTO T106/ASTM C109 at a frequency of no less than one set of three 2-inch grout cubes, or 3-inch cylinders, from each grout plant each day of operation or per every 10 piles, whichever occurs more frequently. The compressive strength shall be the average of the 3 specimens tested.

B. Grout consistency as measured by grout density shall be determined by the Contractor per ASTM C 188/AASHTO T 133 or API RP-13B-1 at a frequency of at least one test per pile, conducted just prior to start of pile grouting. The Baroid Mud Balance used in accordance with API RP-13B-1 is an approved device for determining the grout density of neat cement grout.

C. Grout samples shall be taken directly from the grout plant. Provide grout cube compressive strength and grout density test results to the Design Professional within 24 hours of testing.

3.06 MICROPILE TESTING

A. Pile Load Tests: Perform verification and proof testing of piles at the locations specified herein or designated by the Engineer. Perform compression load testing in accord with ASTM D1143 and tension load testing in accord with ASTM D3689, except as modified herein.

B. Verification Load Tests: Perform pre-production verification pile load testing to verify the design of the pile system and the construction methods proposed prior to installing any production piles. Sacrificial verification test pile(s) shall be constructed in conformance with the approved Shop Drawings. Verification test pile(s) shall be installed at the location(s) shown on the Plans or at location(s) acceptable to Engineer.

1. Verification load tests shall be performed to verify that the installed micropiles will meet the required compression and tension load capacities and load test acceptance criteria and to verify that the length of the micropile load transfer bond zone is adequate. The micropile verification load test results must verify the design and installation methods, and be reviewed and accepted by the Engineer prior to beginning installation of production micropiles.

2. The drilling-and-grouting method, casing length and outside diameter, reinforcing bar lengths, and depth of embedment for the verification test pile(s) shall be identical to those specified for the production piles at the given locations. The verification test micropile structural steel sections shall be sized to safely resist the maximum test load.

3. The maximum verification and proof test loads applied to the micropile shall not exceed 80 percent of the structural capacity of the micropile structural elements, to include steel yield in tension, steel yield or buckling in compression, or grout crushing in compression.

4. The jack shall be positioned at the beginning of the test such that unloading and repositioning during the test will not be required. When both compression and tension load testing is to be performed on the same pile, the pile shall be tested under compression loads prior to testing under tension loads.

C. Verification Test Loading Schedule: Test verification piles designated for compression or tension load testing to a maximum test load of 2.0 times the micropile Design Load shown on the Plans or Shop Drawings as indicated in Table 1.
Pile top movement shall be measured at each load increment. The load-hold period shall start as soon as each test load increment is applied. The verification test pile shall be monitored for creep at the 1.30 Design Load (DL). Pile movement during the creep test shall be measured and recorded at 1, 2, 3, 4, 5, 6, 10, 20, 30, 50, and 60 minutes. The alignment load shall not exceed 5 percent of the DL load. Dial gauges shall be reset to zero after the initial AL is applied.

Table 1			
AL = Alignment Load		DL = Design Load	
Step	Loading	Applied Load	Hold Time (min.)
1	Apply AL		2.5
2	Cycle 1	0.15 DL	2.5
		0.30 DL	2.5
		0.45 DL	2.5
3	Cycle 2	AL	1.0
		0.15 DL	1.0
		0.30 DL	1.0
		0.45 DL	2.5
		0.60 DL	2.5
		0.75 DL	2.5
		0.90 DL	2.5
		1.00 DL	2.5
		AL	1.0
4	Cycle 3	0.15 DL	1.0
		1.00 DL	1.0
		1.15 DL	2.5
		1.30 DL	10 to 60 minutes
		1.45 DL	2.5
		AL	1.0
5	Cycle 4	0.15 DL	1.0
		1.45 DL	1.0
		1.60 DL	1.0
		1.75 DL	2.5
		1.90 DL	2.5
		2.00 DL	10.0
		1.50 DL	5.0
		1.00 DL	5.0
		0.50 DL	5.0
		AL	5.0

The acceptance criteria for micropile verification load tests are:

1. The pile shall sustain the first compression or tension 1.0 DL test load with no more than ½ inch total vertical movement at the top of the pile, relative to the position of the top of the pile prior to testing.

2. At the end of the 1.30 DL creep test load increment, test piles shall have a creep rate not exceeding 0.05 inch/log cycle time (1 to 10 minutes) or 0.10 inch/log cycle time (6 to 60 minutes or the last log cycle if held longer).The creep rate shall be linear or decreasing throughout the creep load hold period.

3. Failure does not occur at the 2.0 DL maximum test load. Failure is defined as load at which attempts to further increase the test load simply result in continued pile movement.

The Engineer will provide the Contractor written confirmation of the micropile design and construction within 3 working days of the completion of the verification load tests. This written confirmation will either confirm the capacities and bond lengths specified in

the Working Drawings for micropiles or reject the piles based upon the verification test results.

D. Verification Test Pile Rejection: If a verification tested micropile fails to meet the acceptance criteria, the Subcontractor shall modify the design, the construction procedure, or both. These modifications may include modifying the installation methods, increasing the bond length, or changing the micropile type. Any modification that necessitates changes to the structure shall require the Engineer's prior review and acceptance. Any modifications of design or construction procedures or cost of additional verification test piles and load testing shall be at the Contractor's expense. At the completion of verification testing, test piles shall be removed down to the elevation specified by the Engineer.

E. Proof Load Tests: Perform proof load tests on the first set of 2 production piles installed at each designated substructure unit prior to the installation of the remaining production piles in that unit. The first set of production piles is the number required to provide the required reaction capacity for the proof tested pile. The initial proof test piles shall be installed at the locations indicated on the Plans or the submitted shop drawings. Proof testing shall be conducted at a frequency of 5% (1 in 20) of the subsequent production piles installed, beyond the first 20, in each abutment and pier. Location of additional proof test piles shall be as designated by the Engineer.

F. Proof Test Loading Schedule: Test piles designated for compression or tension proof load testing to a maximum test load of 1.60 times the micropile Design Load shown on the Plans or Working Drawings. Proof tests shall be made by incrementally loading the micropile in accordance with the following schedule, to be used for both compression and tension

Table 2

AL = Alignment Load		DL = Design Load	
Step	Loading	Applied Load	Hold Time (min.)
1	Apply AL		2.5
2	Load Cycle	0.15 DL	2.5
		0.30 DL	2.5
		0.45 DL	2.5
		0.60 DL	2.5
		0.75 DL	2.5
		0.90 DL	2.5
		1.00 DL	2.5
		1.15 DL	1.0
		1.30 DL	10 to 60 minutes
		1.45 DL	2.5
		1.60 DL	2.5
3	Unload Cycle	1.30 DL	4.0
		1.00 DL	4.0
		0.75 DL	4.0
		0.50 DL	4.0
		0.25 DL	4.0
		AL	4.0

Depending on performance, either a 10-minute or 60-minute creep test shall be performed at the 1.30 DL Test Load. Where the pile top movement between 1 and 10 minutes exceeds 1 mm, the Maximum Test Load shall be maintained an additional 50 minutes. Movements shall be recorded at 1, 2, 3, 5, 6, 10, 20, 30, 50 and 60 minutes. The alignment load shall not exceed 5 percent of DL. Dial gauges shall be reset to zero after the initial AL is applied.

The acceptance criteria for micropile proof load tests are:

1. The pile shall sustain the compression or tension 1.0 DL test load with no more than 1/2-inch total vertical movement at the top of the pile, relative to the position of the top of the pile prior to testing.

2. At the end of the 1.30 DL creep test load increment, test piles shall have a creep rate not exceeding 0.05 inch/log cycle time (1 to 10 minutes) or 0.10 inch/log cycle time (6 to 60 minutes). The creep rate shall be linear or decreasing throughout the creep load hold period.

3. Failure does not occur at the 1.60 DL maximum test load. Failure is defined as the load at which attempts to further increase the test load simply result in continued pile movement.

G. Proof Test Pile Rejection: If a proof-tested micropile fails to meet the acceptance criteria, the Contractor shall immediately proof test another micropile within that footing. For failed piles and further construction of other piles, the Contractor shall modify the design, the construction procedure, or both. These modifications may include installing replacement micropiles, incorporating piles at not more than 50% of the maximum load attained, post grouting, modifying installation methods, increasing the bond length, or changing the micropile type. Any modification that necessitates changes to the structure design shall require the Engineer's prior review and acceptance. Any modifications of design or construction procedures, or cost of additional verification test piles and verification and proof load testing, or replacement production micropiles, shall be at the Contractor's expense.

H. Testing Equipment and Data Recording: Testing equipment shall include dial gauges, dial gauge support, jack and pressure gauge, electronic load cell, and a reaction frame. The load cell is required only for the creep test portion of the verification test. The contractor shall provide a description of test setup and jack, pressure gauge and load cell calibration curves in accordance with the Submittals Section.

I. Design the testing reaction frame to be sufficiently rigid and of adequate dimensions such that excessive deformation of the testing equipment does not occur. Align the jack, bearing plates, and stressing anchorage such that unloading and repositioning of the equipment will not be required during the test.

J. Apply and measure the test load with a hydraulic jack and pressure gauge. The pressure gauge shall be graduated in 100 psi increments or less. The jack and pressure gauge shall have a pressure range not exceeding twice the anticipated maximum test pressure. Jack ram travel shall be sufficient to allow the test to be done without resetting the equipment. Monitor the creep test load hold during verification tests with both the

pressure gauge and the electronic load cell. Use the load cell to accurately maintain a constant load hold during the creep test load hold increment of the verification test.

K. Measure the pile top movement with a dial gauge capable of measuring to 0.001 inch. The dial gauge shall have a travel sufficient to allow the test to be done without having to reset the gauge. Visually align the gauge to be parallel with the axis of the micropile and support the gauge independently from the jack, pile or reaction frame. Use a minimum of two dial gauges when the test setup requires reaction against the ground or single reaction piles on each side of the test pile.

L. The required load test data shall be recorded by the micropile specialty Subcontractor.

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SECTION 02483

PRECAST MODULAR BLOCK GRAVITY RETAINING WALL

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment, and incidentals required to design and install a precast modular block (PMB) retaining wall with or without geosynthetic reinforcement. All work shall be in accordance with the lines, grades and dimensions as shown on the Drawings and shall conform with the design criteria described herein.

B. The manufacturer of precast modular block described under this Section shall utilize a wet-cast concrete mix and exhibit a final handling weight in excess of 1,000 lb per unit.

1.02 MATERIALS COMPLIANCE WITH AIS

A. P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), includes an “American Iron and Steel (AIS)” requirement in section 436 that requires Clean Water State Revolving Loan Fund (CWSRF) and Drinking Water State Revolving Loan Fund (DWSRF) assistance recipients to use iron and steel products that are produced in the United States for projects for the construction, alteration, maintenance, or repair of a public water system or treatment works. This Project meets the definition of such work, and the Environment Protection Agency (EPA) implementation requirements for this AIS requirement are outlined within the DWSRF memorandum titled “Implementation of American Iron and Steel provisions of P.L. 113-76, Consolidated Appropriations Act, 2014” included as part of the RLF Supplemental General Conditions.

B. All parties are required to comply with these requirements and to ensure that all qualifying iron and steel products used in this project must be produced in the United States. See RLF Supplemental General Conditions for additional details.

1.03 RELATED SECTIONS

A. Section 01300 – Submittals

B. Section 02100 – Site Preparation

C. Section 02200 – Earthwork

D. Section 02316 – Structural Excavation, Backfilling and Grading

E. Section 02370 – Erosion and Sedimentation Control

1.04 REFERENCE STANDARDS

A. American Association of State Highway and Transportation Officials (AASHTO), latest edition.

1. AASHTO LRFD Bridge Design Specifications
2. AASHTO M 145 Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes
3. AASHTO M 288 Geosynthetic Specification for Highway Applications
4. AASHTO T 104 Standard Method of Test for Soundness of Aggregate by Use of Sodium Sulfate or Magnesium Sulfate
5. AASHTO T 267 Standard Method of Test for Determination of Organic Content in Soils by Loss of Ignition

B. ASTM International (ASTM), latest edition.

1. ASTM C33 Standard Specification for Concrete Aggregates
2. ASTM C94 Standard Specification for Ready-Mixed Concrete
3. ASTM C136 Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
4. ASTM C143 Standard Test Method for Slump of Hydraulic-Cement Concrete
5. ASTM C231 Standard Test Method for Air Content of Freshley Mixed Concrete by the Pressure Method
6. ASTM C260 Standard Specification for Air-Entraining Admixtures for Concrete
7. ASTM C494 Standard Specification for Chemical Admixtures for Concrete
8. ASTM C666 Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing
9. ASTM C920 Standard Specification for Elastomeric Joint Sealants
10. ASTM C1116 Standard Specification for Fiber-Reinforced Concrete
11. ASTM C1611 Standard Test Method for Slump Flow of Self-Consolidating Concrete
12. ASTM C1776 Standard Specification for Wet-Cast Precast Modular Retaining Wall Units
13. ASTM D422 Standard Test Method for Particle-Size Analysis of Soils (ASTM Standard Withdrawn, No Replacement) (Withdrawn)

14. ASTM D448 Standard Classification for Sizes of Aggregates for Road and Bridge Construction

15. ASTM D698 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort. (12,400 ft-lbf/ft3 (600 kN-m/m3))

16. ASTM D1241 Standard Specification for Materials for Soil-Aggregate Subbase, Base, and Surface Courses

17. ASTM D1248 Standard Specification for Polyethylene Plastics Extrusion Materials for Wire and Cable

18. ASTM D1556 Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method

19. ASTM D1557 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3))

20. ASTM D2412 Stand Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading

21. ASTM D2487 Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)

22. ASTM D2488 Standard Practice for Description and Identification of Soils (Visual-Manual Procedures)

23. ASTM D3034 Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings

24. ASTM D3080 Standard Test Method for Direct Shear Test of Soils Under Consolidated Drained Conditions (Withdrawn 2020)

25. ASTM D3786 Standard Test Method for Bursting Strength of Textile Fabrics – Diaphragm Bursting Strength Tester Method

26. ASTM D4254 Standard Test Methods for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density

27. ASTM D4318 Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

28. ASTM D4354 Standard Practice for Sampling of Geosynthetics and Rolled Erosion Control Products (RECPs) for Testing

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

30. ASTM D4491 Standard Test Methods for Water Permeability of Geotextiles by Permittivity

31. ASTM D4533 Standard Test Method for Trapezoid Tearing Strength of Geotextiles

32. ASTM D4595 Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method

33. ASTM D4632 Standard Test Method for Grab Breaking Load and Elongation of Geotextiles

34. ASTM D4751 Standard Test Method for Determining Apparent Opening Size of a Geotextile

35. ASTM D4759 Standard Practice for Determining Specification Conformance of Geosynthetics

36. ASTM D4767 Standard Test Method for Consolidated Undrained Triaxial Compression Test for Cohesive Soils

37. ASTM D4833 Standard Test Method for Index Puncture Resistance of Geomembranes and Related Products

38. ASTM D4873 Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples

39. ASTM D4972 Standard Test Methods for pH of Soils

40. ASTM D6241 Standard Test Method for the Static Puncture Strength of Geotextiles and Geotextile-Related Products Using a 50-mm Probe

41. ASTM D6916 Standard Test Method for Determining the Shear Strength Between Segmental Concrete Units (Modular Concrete Blocks)

42. ASTM D6938 Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

43. ASTM F2648 Standard Specification for 2 to 60 inch [50 to 1500 mm] Annular Corrugated Profile Wall Polyethylene (PE) Pipe and Fittings for Land Drainage Applications

44. ASTM G51 Standard Test Method for Measuring pH of Soil for Use in Corrosion Testing

45. ASTM G57 Standard Test Method for Measurement of Soil Resistivity Using the Wenner Four-Electrode Method

C. American Society of Civil Engineers (ASCE)

1. Minimum Design Loads and Associated Criteria for Buildings and Other Structures ASCE/SEI 7-10

D. International Code Council (ICC)

1. International Building Code, 2021 Edition

E. National Concrete Masonry Association (NCMA), latest edition.

1. Design Manual for Segmental Retaining Walls

1.05 DEFINITIONS

A. *Drainage Aggregate* – Clean, crushed stone placed within and immediately behind the precast modular block units to facilitate drainage and reduce compaction requirements immediately adjacent to and behind the precast modular block units.

B. *Foundation Zone* – Soil zone immediately beneath the leveling pad.

C. *Geotechnical Engineer* – A licensed Engineer whose primary responsibilities involve the application of the principles of rock and soil mechanics for the design of foundations, retaining structures, and earth structures.

D. *Geotextile* – A geosynthetic fabric manufactured for use as a separation and filtration medium between dissimilar soil materials.

E. *Leveling Pad* – Hard, flat surface upon which the bottom course of precast modular blocks are placed. The leveling pad may be constructed with crushed stone or cast-in-place concrete. A leveling pad is not a structural footing.

F. *Precast Modular Block (PMB) Unit* – Machine-placed, “wet cast” concrete modular block retaining wall facing unit.

G. *Retaining Wall Design Engineer* – A licensed Engineer responsible for the design of the PMB retaining wall.

H. *Retaining Wall Installation Contractor* – The Contractor responsible for the installation of the PMB retaining wall.

I. *Retained Zone* – Soil zone immediately behind the drainage aggregate and wall infill for wall sections designed as modular gravity structures.

J. *Unit Core Fill* – Clean, crushed stone placed within the hollow vertical core of a precast modular block unit. Typically, the same material used for drainage aggregate as defined above.

K. *Wall Infill* – The fill material placed and compacted between the drainage aggregate and the excavated soil face in retaining wall sections designed as modular gravity structures.

1.06 SUBMITTALS

A. See Section 01300, Submittals, for submittal procedures.

B. Product Data. At least 14 days prior to construction, submit the retaining wall product submittal package for review and approval. The submittal package shall include technical specifications and product data from the manufacturer for the following.

1. Precast Modular Block System brochure

2. Precast Modular Block concrete test results as follows:

   a. 28-day compressive strength
   b. Air content
   c. Slump or Slump Flow (as applicable)

3. Drainage Pipe for drainage of structural backfill

4. Geotextile for drainage of structural backfill

5. Geosynthetic Reinforcement as required by the retaining wall Designer

C. Installer Qualification Data. At least 14 days prior to construction, submit qualifications for the installation of the PMB retaining wall system.

D. Retaining Wall Design Calculations and Construction Shop Drawings. At least 14 days prior to construction, furnish construction shop drawings and the supporting structural calculations report for review and approval. This submittal shall include the following.

1. Signed, sealed, and dated drawings and engineering calculations prepared by the Retaining Wall Design Engineer in accordance with these specifications

2. Qualifications Statement of Experience of the Retaining Wall Design Engineer, as noted in Paragraph 1.06.C

3. Retaining Wall Design Engineer’s certificate of liability insurance verifying minimum coverage limits of $1 million per claim and $2 million aggregate

E. Shop Drawings shall include:

1. Overall plan layout of the system, indicating clearances, dimensions, material properties, member sizes, locations, spacing and penetration depths of all members, and locations of various types of lateral supports. Indicate existing and proposed utilities, structures or other obstructions, location, and type of geotechnical instrumentation (as necessary), and location of monitoring points within the area of influence of the excavation.

2. Wall elevations and locations of all bracing.

3. Overall sequence of installation and removal of bracing, indicating levels to which the work will be carried out before bracing is installed or removed.

4. Details, layouts, arrangement, equipment requirements, and method of construction of the proposed excavation support system.

5. Procedures for resolving difficulties arising from misalignment of members exposed during excavation, and criteria for implementing those procedures.

F. Design calculations shall include:

1. Loads on the excavation support system for all stages of excavation, bracing removal, and concrete placement, including material and equipment loads on adjacent ground during construction.

2. Design of wall and all bracing members including all details for all stages of construction. Design shall account for water pressures associated with flood conditions.

3. Theoretical deflections of excavation support system and deformation of structures, pipelines, and other improvements located within the area of influence of the excavation.

G. During construction, submit the following subsequent reports and inspections by the registered engineer who developed the design.

1. Documentation of a pre-construction survey of existing structures in the vicinity of the shoring to compare before and after conditions of these structures.

2. On-site inspections of excavation support system as the systems are constructed.

3. Review of quality control measures and performance data.

4. Certification that the excavation support system is constructed per the applicable design following completion of each support system and following any modifications by Contractor during construction.

1.07 CONSTRUCTION SHOP DRAWING PREPARATION

A. Design of the precast modular block retaining wall shall satisfy the requirements of this Section. Where local design or building code requirements exceed these specifications, the local requirements shall also be satisfied.

B. The Retaining Wall Design Engineer shall note any exceptions to the requirements of this section by listing them in a prominent location on the construction shop drawings and in the design calculations.

C. The precast modular block design, except as noted herein, shall be based on the following:

1. AASHTO Load and Resistance Factor Design (LRFD) methodology

2. NCMA, Design of Segmental Retaining Walls

D. In the event that a conflict is discovered between these specifications and the design standards and methods referenced above, the more stringent requirement shall prevail.

E. Soil Shear Parameters. The Retaining Wall Design Engineer shall prepare the construction shop drawings based upon soil shear strength parameters from the available project data and the recommendations of the project Geotechnical Engineer. If insufficient data exists to develop the retaining wall design, the Retaining Wall Design Engineer shall communicate the specific deficiency of the project information or data to the Engineer in writing.

F. Global Stability. Overall (global) stability shall be evaluated in accordance with the principals of limit equilibrium analysis as set forth in the approved design standards. The minimum factors of safety shall be as shown in Table 1.

Table 1 – Design Factors of Safety	
Design Parameter	Factor of Safety
Normal Service (Static)	1.4
Seismic	1.1
Rapid Drawdown (if applicable)	1.2

G. Seismic Stability. Seismic loading shall be evaluated in accordance with AASHTO Load and Resistance Factor Design (LRFD) methodology.

1.08 QUALITY ASSURANCE

A. Retaining Wall Installation Contractor Qualifications. In order to demonstrate basic competence in the construction of precast modular block walls, the Retaining Wall Installation Contractor shall, if requested by the Engineer, submit project references for installation of modular block retaining wall systems.

1. Retaining Wall Installation Contractor experience documentation for each qualifying project shall include:

   a. Project name and location
   b. Date (month and year) of construction completion
   c. Contact information of Owner or General Contractor
   d. Type (trade name) of precast modular block system built
   e. Maximum height of the wall constructed
   f. Face area of the wall constructed

2. In lieu of the requirements set forth in Paragraph 1.07.A.1. above, the Retaining Wall Installation Contractor must be a certified Precast Modular Block Retaining Wall Installation Contractor as demonstrated by satisfactory completion of a certified precast modular block retaining wall installation training program administered by the precast modular block manufacturer.

B. Retaining Wall Design Engineer Qualifications and Statement of Experience. The Retaining Wall Design Engineer shall submit certification of the following minimum qualifications and experience.

1. The Retaining Wall Design Engineer shall be licensed to practice in the jurisdiction of the project location.

2. The Retaining Wall Design Engineer shall be independently capable of performing all internal and external stability analyses, including those for seismic loading, compound stability, rapid draw-down and deep-seated, global modes of failure.

1.09 QUALITY CONTROL

A. The Retaining Wall Installation Contractor shall inspect the on-site grades and excavations prior to construction and notify the Retaining Wall Design Engineer and Contractor if on-site conditions differ from the elevations and grading conditions depicted in the retaining wall construction shop drawings.

B. The Retaining Wall Installation Contractor shall provide third party testing to confirm compacted density and moisture content of the retained backfill with the following frequency.

1. At least once every 1,000 square-feet (in plan) per 9-inch vertical lift
2. At least once per every 18 inches of vertical wall construction

C. Copies of all testing results shall be provided to the Engineer.

D. The Owner reserves the right to retain the services of a third-party inspection or testing service to perform quality assurance inspection and testing. The cost of inspection shall be the responsibility of the Owner.

E. The Owner’s engagement of a third-party inspection or testing service does not relieve the Retaining Wall Installation Contractor of responsibility to construct the proposed retaining wall in accordance with the approved construction shop drawings and these specifications.

1.10 DELIVERY, STORAGE, AND HANDLING

A. The Retaining Wall Installation Contractor shall inspect the materials upon delivery to ensure that the proper type, grade and color of materials have been delivered.

B. The Retaining Wall Installation Contractor shall store and handle all materials in accordance with the manufacturer’s recommendations as specified herein and in a manner that prevents deterioration or damage due to moisture, temperature changes, contaminants, corrosion, breaking, chipping, UV exposure or other causes. Damaged materials shall not be incorporated into the Work and shall be replaced at no additional cost to the Owner.

C. Geosynthetics

1. All geosynthetic materials shall be handled in accordance with ASTM D4873. The materials shall be stored off the ground and protected from precipitation, sunlight, dirt, and physical damage.

D. Precast Modular Blocks

1. Precast modular blocks shall be stored in an area with positive drainage away from the blocks. Protect the block from mud and excessive chipping and breakage. Precast modular blocks shall not be stacked more than three (3) units high in the storage area.

E. Drainage Aggregate and Backfill Stockpiles

1. Drainage aggregate or backfill material shall not be piled over unstable slopes or areas of the project site with buried utilities.

2. Drainage aggregate material shall not be staged where it may become mixed with or contaminated by poor draining, fine-grained soils such as clay or silt.

PART 2 MATERIALS

2.01 PRECAST MODULAR BLOCK RETAINING WALL UNITS

A. All units shall be wet-cast precast modular retaining wall units conforming to ASTM C1776.

B. All units for the project shall be obtained from the same manufacturer. The manufacturer shall be licensed and authorized to produce the retaining wall units by the precast modular block system patent holder/licensor and shall document compliance with the published quality control standards of the proprietary precast modular block system licensor for the previous three (3) years, or the total time the manufacturer has been licensed, whichever is less. All manufacturing licensing costs shall be the responsibility of the Contractor.

C. Concrete used in the production of the precast modular block units shall be first-purpose, fresh concrete. It shall not consist of returned, reconstituted, surplus or waste concrete. It shall be an original production mix meeting the requirements of ASTM C94 and exhibit the following.

1. Minimum 28-day compressive strength of 4,000 psi.

2. Shall be free of water-soluble chlorides and chloride based accelerator admixtures.

3. Entrained air, as measured by ASTM C231, shall be within the range of 4.5 to 7.5%.

4. Slump of the concrete, as measured by ASTM C143, shall be 4-inches, maximum. If a high range water reducing admixture (HRWRA) is used, the slump shall be within the range of 6 to 9-inches.

5. Slump Flow for Self-Consolidating Concrete (SCC) mix designs shall be between 18 inches and 32 inches as tested in accordance with ASTM C1611.

D. Each concrete block shall be cast in a single continuous pour without cold joints. Precast modular block units shall conform to the manufactures noted dimensions.

E. Individual block units shall have a nominal height of 18 inches.

F. With the exception of half-block units, corner units and other special application units, the precast modular block units shall have two (2), circular dome shear knobs that are 10-inch, 7.5-inch, or 6.75-inch in diameter and 4-inch or 2-inch in height. The shear knobs shall fully index into a continuous semi-cylindrical shear channel in the bottom of the block course above.

1. The peak interlock shear between any two (2) vertically stacked precast modular block units, with 10-inch diameter shear knobs, measured in accordance with ASTM D6916 shall exceed 6,500 lb/ft (95 kN/m) at a minimum normal load of 500 lb/ft (7kN/m). as well as an ultimate peak interface shear capacity in excess of 11,000 lb/ft (160 kN/m).

2. The peak interlock shear between any two (2) vertically stacked precast modular block units, with 7.5-inch or 6.75-inch diameter shear knobs, measured in accordance with ASTM D6916 shall exceed 1,850 lb/ft (27 kN/m) at a minimum normal load of 500 lb/ft (7kN/m) as well as an ultimate peak interface shear capacity in excess of 10,000 lb/ft (146 kN/m).

3. Test specimen blocks tested under ASTM D6916 shall be actual, full-scale production blocks of known compressive strength. The interface shear capacity reported shall be corrected for a 4,000 psi (27.6 MPa) concrete compressive strength. Regardless of precast modular block configuration, interface shear testing shall be completed without the inclusion of unit core infill aggregate.

G. Without field cutting or special modification, the precast modular block units shall be capable of achieving a minimum radius of 14.5 feet.

H. The precast modular block units shall be manufactured with an integrally cast shear knobs that establishes a standard horizontal set-back for subsequent block courses. The precast modular block system shall be available in the four (4) standard horizontal set-back facing batter options listed in Table 2.

Table 2 – Standard Horizontal Set-back Facing Batter

Horizontal Set-back / Block Course	Max. Facing Batter
3/8 "	1.2°
1-5/8 "	5.2°
9-3/8 "	27.5°
16-5/8 "	42.7°

I. The precast modular block units shall be furnished with the required shear knobs that provide the facing batter required in the construction shop drawings.

J. The precast modular block unit face color and texture shall be selected by the Owner from the available range of colors and textures available from the precast modular block manufacturer. Each textured block facing unit shall be a minimum of 5.76 ft^2 with a unique texture pattern that repeats with a maximum frequency of once in any 15 ft^2 of wall face.

K. All precast modular block units shall be sound and free of cracks or other defects that would interfere with the proper installation of the unit, impair the strength or performance of the constructed wall. Units to be used in exposed wall construction shall not exhibit chips or cracks in the exposed face or faces of the unit that are not otherwise permitted. Chips smaller than 1.5 inch in its largest dimension and cracks not wider than 0.012 inch and not longer than twenty-five percent (25%) of the nominal height of the PMB unit shall be permitted. Units with bug holes in the exposed architectural face smaller than 0.75 inch in its largest dimension shall be permitted. Bug holes, water marks, and color variation on non-architectural faces are acceptable. Units that exhibit cracks that are continuous through any solid element of the PMB unit shall not be incorporated in the work regardless of the width or length of the crack.

L. Preapproved Manufacturers

1. Manufacturers of Redi-Rock Retaining Wall Systems as licensed by Redi-Rock International, LLC, Petoskey, MI or approved equal.

2.02 GEOTEXTILE

A. Nonwoven geotextile fabric shall be placed as indicated on the retaining wall construction shop drawings and shall be placed in the V-shaped joint between adjacent block units on the same course. The nonwoven geotextile fabric shall meet the requirements Class 3 construction survivability in accordance with AASHTO M 288.

B. Preapproved Nonwoven Geotextile Products

1. Mirafi 140N
2. Propex Geotex 451
3. Skaps GT-142
4. Thrace-Linq 140EX
5. Carthage Mills FX-40HS
6. Stratatex ST 142

2.03 DRAINAGE AGGREGATE AND WALL INFILL

A. Drainage aggregate (and wall infill for retaining walls designed as modular gravity structures) shall be a durable crushed stone conforming to No. 57 size per ASTM C33 with the particle-size distribution requirements per ASTM D422 as shown in Table 3.

Table 3 - Particle Size Distribution Requirements	
U.S. Standard Sieve Size	% Passing
1½ "	100
1 "	95-100
½ "	25-60
No. 4	0-10
No. 8	0-5

2.04 LEVELING PAD

A. The PMB units shall be placed on a leveling pad constructed from crushed stone or unreinforced concrete. The leveling pad shall be constructed to the dimensions and limits shown on the retaining wall design drawings prepared by the Retaining Wall Design Engineer.

B. Crushed stone used for construction of a granular leveling pad shall meet the requirements of the drainage aggregate and wall infill described in Table 2 or a preapproved alternate material.

C. Concrete used for construction of an unreinforced concrete leveling pad shall satisfy the criteria for AASHTO Class B. The concrete shall be cured a minimum of 12 hours prior to placement of the precast modular block wall retaining units and exhibit a minimum 28-day compressive strength of 2,500 psi (17.2 MPa).

2.05 DRAINAGE

A. Drainage Pipe

1. Drainage collection pipe shall be a 4-inch diameter, 3-hole perforated, HDPE pipe with a minimum pipe stiffness of 22 psi (152 kPa) per ASTM D2412.

2. The drainage pipe shall be manufactured in accordance with ASTM D1248 for HDPE pipe and fittings.

B. Preapproved Drainage Pipe Products

1. ADS 3000 Triple Wall pipe as manufactured by Advanced Drainage Systems, Hilliard, OH or approved equal

PART 3 EXECUTION

3.01 GENERAL

A. All work shall be performed in accordance with OSHA safety standards, state and local building codes, and manufacturer's requirements.

B. The Contractor is responsible for the location and protection of all existing underground utilities. Any new utilities proposed for installation in the vicinity of the retaining wall, shall be installed concurrent with retaining wall construction. The Contractor shall coordinate the work of subcontractors affected by this requirement.

C. New utilities installed below the retaining wall shall be backfilled and compacted to a minimum of ninety-eight percent (98%) maximum dry density per ASTM D698 standard proctor.

D. The Contractor is responsible to ensure that safe excavations and embankments are maintained throughout the course of the project.

E. All work shall be inspected by the Owner's Representative.

3.02 EXAMINATION

A. Prior to construction, the Contractor and Retaining Wall Installation Contractor shall examine the areas in which the retaining wall will be constructed to evaluate compliance with the requirements for installation tolerances, worker safety and any site conditions affecting performance of the completed structure. Installation shall proceed only after unsatisfactory conditions have been corrected.

3.03 PREPARATION

A. Fill Soil

1. Verify that retained backfill material placed within a horizontal distance of one (1.0) times the wall height behind the wall blocks satisfies the criteria of this Section.

2. Verify that any fill soil installed in the foundation and retained soil zones of the retaining wall satisfies the specification of the Retaining Wall Design Engineer as shown on the submittals and as described in the Drawings.

B. Excavation

1. Excavate to the lines and grades required for construction of the precast modular block retaining wall as shown on the Drawings. The Contractor shall minimize over-excavation and provide excavation support as required.

2. Over-excavated soil shall be replaced with compacted select material fill in conformance with the specifications of the Retaining Wall Design Engineer and Section 02200, Earthwork.

3. Embankment excavations shall be bench cut as directed by the project Geotechnical Engineer.

C. Foundation Preparation

1. Prior to construction of the precast modular block retaining wall, the leveling pad area and undercut zone (if applicable) shall be cleared and grubbed. All topsoil, brush, frozen soil, and organic material shall be removed. Additional foundation soils found to be unsatisfactory beyond the specified undercut limits shall be undercut and replaced with approved select material fill as directed by the project Geotechnical Engineer. The Contractor shall document the volume of undercut and replacement.

2. Following excavation for the leveling pad and undercut zone (if applicable), evaluate the in-situ soil in the foundation and retained soil zones.

   a. The Retaining Wall Design Engineer shall verify that the shear strength of the in-situ soil assumed by the wall design is appropriate.

   b. The Retaining Wall Design Engineer shall verify that the foundation soil exhibits sufficient ultimate bearing capacity to satisfy the requirements indicated on the retaining wall construction shop drawings.

D. Leveling Pad

1. The leveling pad shall be constructed to provide a level, hard surface on which to place the first course of precast modular block units. The leveling pad shall be placed in the dimensions shown on the retaining wall construction drawings and extend to the limits indicated.

2. Crushed Stone Leveling Pad. Crushed stone shall be placed in uniform maximum lifts of 6 inches. The crushed stone shall be compacted by a minimum of three (3) passes of a vibratory compactor capable of exerting 2,000 lb (8.9 kN) of centrifugal force and to the satisfaction of the Engineer.

3. Unreinforced Concrete Leveling Pad. The concrete shall be placed in the same dimensions as those required for the crushed stone leveling pad. The Retaining Wall Installation Contractor shall erect proper forms as required to ensure the accurate placement of the concrete leveling pad according to the retaining wall construction drawings.

3.04 PRECAST MODULAR BLOCK WALL SYSTEM INSTALLATION

A. The precast modular block structure shall be constructed in accordance with the construction drawings, these specifications, and the recommendations of the retaining wall system component manufacturers. Where conflicts exist between the manufacturer's recommendations and these specifications, the more stringent requirement shall prevail.

B. Drainage components. Pipe, geotextile, and drainage aggregate shall be installed as shown on the construction shop drawings.

C. Precast Modular Block Installation

1. The first course of block units shall be placed with the front face edges tightly abutted together on adjacent blocks, on the prepared leveling pad at the locations and elevations shown on the Drawings. The Retaining Wall Installation Contractor shall ensure that the bottom course of block units is in full contact with the leveling pad, are set level and true, and are properly aligned according to the locations shown on the Drawings.

2. Backfill shall be placed in front of the bottom course of blocks prior to placement of subsequent block courses. Nonwoven geotextile fabric shall be placed in the V-shaped joints between adjacent blocks. Drainage aggregate shall be placed in the V-shaped joints between adjacent blocks and extend to a minimum distance of 12 inches behind the block unit.

3. Drainage aggregate shall be placed in 9-inch maximum lifts and compacted by a minimum of three (3) passes of a vibratory plate compactor capable exerting a minimum of 2,000 lb (8.9 kN) of centrifugal force.

4. Unit core fill shall be placed in the precast modular block unit vertical core slot. The core fill shall completely fill the slot to the level of the top of the block unit. The top of the block unit shall be broom-cleaned prior to placement of subsequent block courses. No additional courses of precast modular blocks may be stacked before the unit core fill is installed in the blocks on the course below.

5. Base course blocks for gravity wall designs (without geosynthetic soil reinforcement) may be furnished without vertical core slots. If so, disregard requirements for unit core fill in the base course blocks in this application.

6. Nonwoven geotextile fabric shall be placed between the drainage aggregate and the retained soil (gravity wall design).

7. Subsequent courses of block units shall be installed with a running bond (half block horizontal course-to-course offset). With the exception of 90-degree corner units, the shear channel of the upper block shall be fully engaged with the shear knobs of the block course below. The upper block course shall be pushed forward to fully engage the interface shear key between the blocks and to ensure consistent face batter and wall alignment. Drainage aggregate, unit core fill, geotextile, and properly compacted backfill shall be complete and in-place for each course of block units before the next course of blocks is stacked.

8. The elevation of retained soil fill shall not be less than 1 block course (18 inches) below the elevation of the retained backfill throughout the construction of the retaining wall.

9. If included as part of the precast modular block wall design, cap units shall be secured with an adhesive in accordance with the precast modular block manufacturer’s recommendation.

D. Construction Tolerance: Allowable construction tolerance of the retaining wall shall be as follows:

1. Deviation from the design batter and horizontal alignment, when measured along a 10-foot straight wall section, shall not exceed 3/4 inch.

2. Deviation from the overall design batter shall not exceed 1/2 inch per 10 feet of wall height.

3. The maximum allowable offset (horizontal bulge) of the face in any precast modular block joint shall be 1/2 inch.

4. The base of the precast modular block wall excavation shall be within 2 inches of the staked elevations, unless otherwise approved by the Inspection Engineer.

5. Differential vertical settlement of the face shall not exceed 1 foot along any 200 feet of wall length.

6. The maximum allowable vertical displacement of the face in any precast modular block joint shall be 1/2 inch.

7. The wall face shall be placed within 2 inches of the horizontal location staked.

3.05 WALL INFILL AND BACKFILL PLACEMENT

A. Backfill material placed immediately behind the drainage aggregate shall be compacted as follows.

1. Ninety-eight percent (98%) of maximum dry density at ± 2% optimum moisture content per ASTM D698 standard proctor or eighty-five percent (85%) relative density per ASTM D4254.

B. Compactive effort within 3 feet of the back of the precast modular blocks shall be accomplished with walk-behind compactors. Compaction in this zone shall be 95% of maximum dry density as measured in accordance with ASTM D698 standard proctor or 80% relative density per ASTM D 254. Heavy equipment shall not be operated within 3 feet of the back of the precast modular blocks.

C. Backfill material shall be installed in lifts that do not exceed a compacted thickness of 9 feet.

D. At the end of each workday, the Retaining Wall Installation Contractor shall grade the surface of the last lift of the granular wall infill to a 2 to 4 percent (2% - 4%) slope away from the precast modular block wall face and compact it.

E. The Contractor shall protect the precast modular block wall structure against surface water runoff at all times through the use of berms, diversion ditches, silt fence, temporary drains and/or any other necessary measures to prevent soil staining of the wall face, scour of the retaining wall foundation or erosion of the reinforced backfill or wall infill.

3.06 OBSTRUCTIONS IN THE INFILL ZONE

A. The Retaining Wall Installation Contractor shall make all required allowances for obstructions behind and through the wall face in accordance with the approved construction shop drawings.

B. Should unplanned obstructions become apparent for which the approved construction shop drawings do not account, the affected portion of the wall shall not be constructed until the Retaining Wall Design Engineer can appropriately address the required procedures for construction of the wall section in question.

3.07 COMPLETION

A. For walls supporting unpaved areas, a minimum of 12 inches of compacted, low-permeability fill shall be placed over the granular wall infill zone of the precast modular block retaining wall structure. The adjacent retained soil shall be graded to prevent ponding of water behind the completed retaining wall.

B. For retaining walls with crest slopes of 5H:1V or steeper, silt fence shall be installed along the wall crest immediately following construction. The silt fence shall be located 3 to 4 feet behind the uppermost precast modular block unit. The crest slope above the wall shall be immediately seeded to establish vegetation. The General Contractor shall ensure that the seeded slope receives adequate irrigation and erosion protection to support germination and growth.

C. The General Contractor shall confirm that the as-built precast modular block wall geometries conform to the requirements of this Section. The Contractor shall notify the Engineer of any deviations.

END OF SECTION

SECTION 02501

PAVEMENT AND DRAINAGE IMPROVEMENTS

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment, and incidentals required; and construct or reconstruct streets, parking lots or other paved areas so designated on the Drawings, including drainage improvements. The Drawings identify the right-of-way limits available for construction.

B. This project includes installation of piping and other improvements requiring the demolition of paved asphalt surfaces. Sawcut trench edges through paved areas in straight lines to achieve a consistent repair width. The Drawings include details for slurry and gravel backfill and repair of trenches. All gravel repairs within paved areas shall conform to the specifications for Base Course.

1.01 MATERIALS COMPLIANCE WITH AIS

A. P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), includes an “American Iron and Steel (AIS)” requirement in section 436 that requires Clean Water State Revolving Loan Fund (CWSRF) and Drinking Water State Revolving Loan Fund (DWSRF) assistance recipients to use iron and steel products that are produced in the United States for projects for the construction, alteration, maintenance, or repair of a public water system or treatment works. This Project meets the definition of such work, and the Environment Protection Agency (EPA) implementation requirements for this AIS requirement are outlined within the DWSRF memorandum titled “Implementation of American Iron and Steel provisions of P.L. 113-76, Consolidated Appropriations Act, 2014” included as part of the RLF Supplemental General Conditions.

B. All parties are required to comply with these requirements and to ensure that all qualifying iron and steel products used in this project must be produced in the United States. See RLF Supplemental General Conditions for additional details.

1.02 RELATED SECTIONS

A. Section 01300 – Submittals

B. Section 01450 – Field Quality Control

C. Section 02100 – Site Preparation

D. Section 02200 – Earthwork

E. Section 02315 – Excavation, Trenching and Backfilling

F. Section 02316 – Structural Excavation, Backfilling and Grading

G. Section 02370 – Erosion and Sedimentation Control

H. Section 02516 – Excavation, Trenching and Backfilling

I. Section 02920 – Seeding

J. Section 03100 – Concrete Formwork

K. Section 03200 – Concrete Reinforcement

L. Section 03250 – Concrete Joints and Joint Accessories

M. Section 03300 – Cast-In-Place Concrete

N. Section 03350 – Concrete Finishes

1.03 REFERENCE STANDARDS

A. American Association of State Highway and Transportation Officials (AASHTO), latest edition:

1. AASHTO M 57 Standard Specification for Materials for Embankments and Subgrades

2. AASHTO M 81 Standard Specification for Cutback Asphalt (Rapid-Curing Type)

3. AASHTO M 82 Standard Specification for Cutback Asphalt (Medium-Curing Type)

4. AASHTO M140 Standard Specification for Emulsified Asphalt

5. AASHTO M 145 Standard Specification for Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes

6. AASHTO M 146 Standard Specification for Terms Relating to Subgrade, Soil Aggregate, and Fill Materials

7. AASHTO M208 Standard Specification for Cationic Emulsified Asphalt

8. AASHTO T 2 Standard Method of Test of Sampling of Aggregate

9. AASHTO T 27 Standard Method of Test for Sieve Analysis of Fine and Coarse Aggregates

10. AASHTO T 30 Standard Method of Test for Mechanical Analysis of Extracted Aggregate

11. AASHTO T 96 Standard Method of Test for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine (**INACTIVE**)

12. AASHTO T 99 Standard Method of Test for Moisture-Density Relations of Soils Using a 2.5 kg [5.5 lb.] Rammer and a 305 mm [12 in.] Drop

13. AASHTO T 104 Standard Method of Test for Soundness of Aggregate by Use of Sodium Sulfate or Magnesium Sulfate

14. AASHTO T 164 Standard Method of Test for Quantitative Extraction of Asphalt Binder from Hot-Mix Asphalt (HMA)

15. AASHTO T 166 Standard Method of Test for Bulk Specific Gravity (Gmb) of Compacted Hot-Mix Asphalt (HMA) Using Saturated Surface-Dry Specimens

16. AASHTO T 167 Standard Method of Test for Compressive Strength of Hot-Mix Asphalt Mixtures

17. AASHTO T 168 Standard Method of Test for Sampling Bituminous Paving Mixtures

18. AASHTO T 180 Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54 kg [10 lb.] Rammer and a 457 mm [18 in.] Drop

19. AASHTO T 198 Standard Method of Test for Splitting Tensile Strength of Cylindrical Concrete Specifications

20. AASHTO T 209 Standard Method of Test for Theoretical Maximum Specific Gravity (Gmm)of and Density of Hot-Mix Asphalt (HMA)

21. AASHTO T 230 Standard Method of Test for Determining Degree of Pavement Compaction of Bituminous Aggregate Mixtures (**INACTIVE**)

22. AASHTO T 280 Standard Method of Test for Concrete Pipe, Manhole Sections, or Tile

23. AASHTO T 310 Standard Method of Test for In-Place Density and Moisture Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

B. ASTM International (ASTM), latest edition

1. ASTM C76 Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe

C. Arkansas Department of Transportation (ARDOT):

1. Standard Specifications for Highway Construction, current edition

1.04 SUBMITTALS

A. See Section 01300, Submittals, for submittal procedures.

B. Furnish test data to indicate compliance with the following:

1. Source and classification of Select Backfill Material
2. In-place density of pavement subgrade
3. Gradation and mechanical properties of base course material
4. In-place density of base course and bituminous surface course
5. Classification of drainage pipe
6. Compressive strength test results of concrete

C. Certify the Contractor is not associated with the independent testing laboratory nor does the Contractor, or its officers have a beneficial interest in the laboratory.

D. Provide the qualifications of independent testing laboratory, including name and address. Laboratories affiliated with the Contractor or in which the Contractor or its officers have a beneficial interest are not acceptable.

1.05 QUALITY ASSURANCE

A. Responsibilities for providing the following quality assurance testing activities are defined in Section 01450, Field Quality Control.

B. Furnish manufacturer or supplier certification for all products and materials. Coordinate with the Engineer the testing of all materials from off-site sources including select and base course materials.

C. Unless otherwise noted, conduct testing in accordance with the following minimum frequencies:

1. Determine a moisture-density relationship for each type of subgrade and aggregate base course material encountered or provided and conduct testing in accordance with AASHTO T 99 or T 180.

2. Test all aggregates for base course and bituminous mixtures for wear, soundness, and gradation in accordance with AASTHO T 96, T 104, T 27 (base course), T 30 (bituminous mixture), respectively. Conduct a minimum of one (1) test each to determine the characteristics of each type of aggregate proposed for the project.

3. Conduct field density and moisture testing of pavement subgrade in accordance with AASHTO T 310. Test in-place density and moisture at a frequency of one (1) test per 5,000 square-feet of subgrade.

4. Compact base course to a density of not less than 95 percent (95%) of theoretical density. Conduct field density and moisture testing of aggregate base course in accordance with AASHTO T 310. Test in-place density and moisture at a frequency of one (1) test per 5,000 square-feet of base course.

5. Test bituminous mixtures for maximum specific gravity, extraction, and gradation in accordance with AASHTO T 209, T 164 and T 30, respectively. Conduct bitumen extraction and sieve analysis of extracted aggregate at a frequency of one (1) test each per 300 tons of asphalt surface course.

6. Compact finished asphalt surface courses to a density of not less than 92 percent (92%) of theoretical density. Collect samples for the determination of density from the finished pavement by coring and test for bulk specific gravity in accordance with AASHTO T 166. The testing laboratory taking such samples shall repair the cuts in a manner agreeable to the Owner and the Engineer. Test in-place thickness and density at a frequency of one (1) test each per 400 linear-feet of pavement and at least one (1) each per street.

7. Conduct sampling and testing of concrete curb and gutter in accordance with Section 03300 Cast-in-Place Concrete. Test concrete for slump, temperature and air content at delivery at a frequency of one (1) per 500 linear-feet of curbing, a minimum of one (1) each per day. Cast one (1) set of cylinders for compression testing every 500 linear-feet of curbing, a minimum of one (1) set per day.

8. Conduct sampling and testing of concrete ditch paving in accordance with Section 03300 Cast-in-Place Concrete. Test concrete for slump, temperature and air content at delivery at a frequency of one (1) per 500 linear-feet of ditch paving, a minimum of one (1) each per day. Cast one (1) set of cylinders for compression testing every 500 linear-feet of ditch paving; a minimum of one (1) set per day.

9. Conduct sampling and testing of concrete sidewalk in accordance with Section 03300 Cast-in-Place Concrete. Test concrete for slump, temperature and air content at delivery at a frequency of one (1) per 500 linear-feet of sidewalk, a minimum of one (1) each per day. Cast one (1) set of cylinders for compression testing every 500 linear-feet of sidewalk, a minimum of one (1) set per day.

10. Conduct sampling and testing of area fill in accordance with Section 02200, Earthwork. Compact area fill to a density of not less than 95 percent (95%) in accordance with AASHTO T 99.

1.06 COORDINATION

A. Completely coordinate the work of this Section with the work of other sections. Verify at the site both the dimensions and work of other trades adjoining items of work in this Section before commencement of items herein specified.

B. Furnish to the pertinent trades all items included under this Section that are to be built into the work of other sections.

1.07 FIELD MEASUREMENTS

A. Take field measurements at the site to verify or supplement indicated dimensions and to ensure proper coordination of all other construction items.

PART 2 PRODUCTS

2.01 BASE COURSE

A. Obtain base material from approved sources with approved crusher equipment. Handle the materials in such a manner that secures a uniform and satisfactory product.

B. Material shall consist of crusher run stone or a mixture of crushed stone and soil mortar uniformly mixed and so proportioned as to meet all the requirements hereinafter specified. The stone shall be hard and durable with a percent of wear of not greater than 45, as determined by the Los Angeles Abrasion Test, and the mixture shall be free from objectionable, injurious, or deleterious matter.

C. Unless otherwise noted, crushed stone base course material shall conform to Class 7 Aggregate Base Course (SB-2) as described on the following table.

GRADING REQUIREMENTS
Class 7 Aggregate Base Course

Sieve Size	Percent Passing
1 1/2-inch	100%
3/4-inch	50% - 90%
#4	25% - 50%
#40	10% - 30%
#200	3% - 10%

D. The fraction passing the #200 sieve shall not be greater than two-thirds (2/3) the fraction passing the #40 sieve. The fraction passing the #40 sieve shall have a Liquid Limit (L.L.) not greater than 25 and Plasticity Index (P.I.) not greater than six (6).

E. The blading of materials on the roadway in order to obtain a mixture that will comply with the above requirements will not be permitted.

2.02 PRIME AND TACK ASPHALTS

A. In general, for prime coats, use a medium curing cut-back asphalt, an anionic emulsified asphalt, a cationic emulsified asphalt, or an asphalt penetrating prime. In general, for tack coats, use a rapid curing cut-back, a cationic emulsified asphalt, or an anionic emulsified asphalt. Materials shall conform to the following requirements:

1. Rapid Curing Cut-back Asphalt (RC-70, RC-250, RC-800 or RC-300) conforming to AASHTO M 81.

2. Medium Curing Cut-back Asphalt (MC-30, MC-70, MC-250, MC-800, or MC-3000) conforming to AASHTO M 82.

3. Anionic Emulsified Asphalt (SS-1 or SS-1h) conforming to AASHTO M 140.

4. Cationic Emulsified Asphalt (CSS-1 or CSS-1h) conforming to AASHTO M 208.

5. Asphalt Penetrating Prime conforming to the following:

Asphalt Penetrating Prime		
Item	Min.	Max.
Flash Point, Pensky Martens	100° F	--
Viscosity, Saybolt Furol at 122° F, seconds	40	120
Distillation AASHTO T 78		
Over at 437° F vol. percent total solvent	15	45
Over at 500° F vol. percent total solvent	55	80
Over at 600° F vol. percent total solvent	85	--
Residue from distillation to 680° F vol. percent	50	--
Test of residue from distillation:		
Softening point (R&B)	115° F	165° F
Penetration at 77° F, mm/10	10	90

2.03 BITUMINOUS SURFACE COURSES

A. The asphalt wearing surface shall consist of a mixture of mineral aggregate and asphalt cement in the following proportions by weight:

GRADING REQUIREMENTS Mineral Aggregate and Asphalt Cement Percent Passing		
Sieve Size	Type 2 Asphalt	Type 3 Asphalt
1-inch	--	--
3/4-inch	100%	--
1/2-inch	85% - 100%	100%
#4	47% - 80%	54% - 80%
#8	28% - 63%	32% - 64%
#16	19% - 50%	22% - 51%
#30	13% - 40%	14% - 43%
#50	8% - 29%	8% - 32%
#100	5% - 20%	5% - 21%
Bitumen	4.5% - 7.5%	4.5% - 7.5%

B. At least one-half (1/2) of the fraction passing the #200 sieve shall comply with the requirements for mineral filler, and in no case shall the mineral aggregate contain less than five percent (5%) mineral filler.

C. The general composition limits set forth in the previous table, are master ranges of tolerance to govern mixtures made from any raw material meeting specification requirements and are maximum and minimum for all cases. The Engineer will specify or approve a job mixture for each project coming within the above limits, which in his judgement, will be suitable and the maximum permissible variations from the mixture shall be as follows:

MAXIMUM PERMISSIBLE VARIATIONS Mineral Aggregate and Asphalt Cement	
Material	Percent Variation
Total retained on 3/4-inch sieve	+/- 7%
Total retained on 1/2-inch sieve	+/- 7%
Total retained on #4 sieve	+/- 7%
Total retained on #10 sieve	+/- 5%
Total passing #40 sieve	+/- 4%
Total passing #80 sieve	+/- 4%
Total passing #200 sieve	+/- 2%
Bitumen	+/-0.4%
Mixture temperature on delivery	+/-15 deg. F

D. Unless otherwise noted, asphalt surface course shall be Type 3.

2.04 CONCRETE

A. Concrete: A five and one-half (5 1/2) bag mix with a 28-day compressive strength of at least 3,500 psi.

B. Use an air-entraining agent with all mixtures when the concrete will be exposed, for freeze/thaw damage resistance.

2.05 SLURRY BACKFILL

A. See Section 02315, Excavation, Trenching and Backfilling for specifications on Slurry Backfill.

2.06 CONCRETE DRAINAGE PIPE

A. Reinforced concrete drainage pipe: Class III pipe conforming to ASTM C76. Joint material shall conform to AASHTO T 198, Type B.

PART 3 EXECUTION

3.01 LINE AND GRADE

A. The Engineer shall provide survey control points, as indicated on the construction plans, for use by the Contractor. The Contractor shall be responsible for setting his own line and grade stakes, including but not limited to street and drainage baselines and other alignments, profile grades and elevations, and temporary benchmarks. All care shall be taken by the Contractor to preserve the survey control points. In the event of willful or

careless destruction of these points, the Contractor shall be liable for the cost of re-establishing said points.

3.02 PAVEMENT SUBGRADE

A. Prepare and shape the subgrade to the line and grade necessary to obtain the finished elevations as shown on the plans. Compact the subgrade to a density of not less than 100 percent (100%) at ± two percent (2%) of optimum moisture as determined by field density tests based on AASHTO T 99. Proof roll and inspect the subgrade prior to placing the base course.

3.03 UNDERCUT, EXCAVATION AND BACKFILL (SELECT MATERIAL)

A. When encountering soft areas or areas in which the proper compaction cannot be obtained, undercut those areas, and remove the unsuitable material to the depth necessary to obtain the proper density. Place select material in the undercut area in lifts not to exceed 8-inches and compact each lift to the specified density at or near the optimum moisture content.

3.04 BASE COURSE

A. Deliver the material to the job site and deposit it in uniform loads along the proposed street. Deposit and compact base course materials in layers not to exceed 3 inches

B. After the materials have been deposited by truck, blade the materials, spreading uniformly over the entire surface of the street. Continue this method until the base thickness has been obtained. Water the material when necessary, during the spreading procedure to obtain the appropriate moisture content. Compact the material until the density is not less than 95 percent (95%) as determined by field density tests.

C. Proof roll the finished base course with a loaded dump truck and inspect for rutting or soft areas. Remove and replace unsatisfactory areas of the base course and proof roll again prior to the installation of the asphalt surface.

3.05 PRIME AND TACK COAT

A. Surfaces to receive prime or tack coat shall be dry and shall be approved by the Engineer.

B. Apply primer and tack coats in accordance with the manufacturer’s instructions and the Arkansas Highway and Transportation Department Standard Specifications for Highway Construction. Apply primer to contact surfaces of curb and gutters.

C. Apply prime coats on prepared base or subbase courses and tack coats on asphalt or concrete surfaces at the following rates:

1. Prime Coat: 0.20 – 0.30 Gallon/Square Yard
2. Tack Coat: 0.05 – 0.10 Gallon/Square Yard

3.06 BITUMINOUS SURFACE COURSES

A. Install bituminous (asphalt) surface courses in accordance with ARDOT Standard Specifications for Highway Construction.

B. The methods employed in performing the Work and all equipment, tools, and plant machinery used in executing any part of the Work shall be subject to the approval of the Engineer. When they are found unsatisfactory, change, and improve equipment and procedures as required by the Engineer and these Specifications. Maintain all equipment, tools, and plant machinery in a satisfactory working condition.

C. Prior to arrival of the asphalt mixture at the job site, clean the prepared surface of all loose and foreign materials, and prime or tack the surface as specified. Do not place asphalt on a surface that shows evidence of moisture. Paint surfaces of curbing, gutters, manholes, and other structures that will be exposed to the asphalt with a thin coating of rapid curing cut-back asphalt or emulsified asphalt.

D. When a previously laid asphalt course becomes coated with dirt or foreign material to such extent as to prevent proper adhesion of the later course, the earlier course shall be cleaned and given a tack coat, if necessary, prior to placing the succeeding course.

E. At the time of delivery to the job site, the temperature of asphalt mixture shall not be lower than 250° Fahrenheit.

F. Do not place asphalt when the atmospheric temperature is below 40° Fahrenheit or during unsuitable weather.

G. Upon arrival at the job site, dump the asphalt mixture immediately into a mechanical spreading and finishing (lay down) machine, and spread and strike off in a uniform layer of sufficient thickness. Hand spreading will be permitted only on small turnouts and other small areas inaccessible to the spreader. Spread and finish asphalt on normal two-lane roads in one-half (1/2) widths. Unless two (2) machines are employed, the spreader shall alternate between the two (2) half-widths with such frequency that the second half width shall be laid the next day after the first half is laid.

H. When more than one (1) asphalt course is called for on the Drawings, the succeeding course shall follow not later than 72 hours unless the preceding course is given a tack coat. If for any reason proper bond is not obtained between the two courses, a tack coat shall be used even though the lapsed time has been less than 72 hours.

I. Rolling shall start longitudinally at the side and proceed toward the center of the roadway, overlapping on successive trips by at least one-half (1/2) of the width of the rear roller wheel. Roll the mixture continuously until all roller marks are eliminated and no further compaction is possible. The motion of the roller shall at all times be slow enough and smooth enough to avoid displacement or cracking of the mixture. Correct displacement resulting from reversing the direction of the roller, or from any other cause, by the use of rakes and fresh material. To prevent adhesion of asphalt to the roller, keep the wheels properly moistened with water and/or oil. Excess of such moisture will not be permitted.

J. Asphalt rollers shall be of a type approved by the Engineer. As a guide, three (3) axle tandems and three (3) wheeled rollers shall be of such weight that the compression load on the drive wheels is not less than 325 pounds per inch of tire width. Tandem rollers shall weigh not less than eight (8) tons.

K. When the mixture is laid in a half width and a satisfactory joint is not secured, or if breakdowns cause a delay in placing the second half, cut back the existing joint and paint it with a thin coat of hot asphalt cement or asphalt thinned with naphtha. See the following requirements for preparing transverse joints at the end of the day's work.

L. The roller shall pass over the unprotected end of the freshly laid mixture only when the laying of the course is discontinued for such length of time as to permit the mixture to become chilled. In all cases, make provisions for proper bond with the new mixture by cutting or trimming back the joint to expose an unsealed or granular surface for the full specified depth of the course.

M. At the end of each day's work, form joints by laying and rolling against boards of the thickness of the compacted mixture, placed across the entire width of the base course, or by other methods as may be approved by the Engineer. When the laying of the course is resumed, paint the exposed edge of the joint with a thin coat of hot asphalt cement or asphalt cement thinned with naphtha. Rake the fresh mixture against the joint, thoroughly tamp with hot tampers, and roll the finished surface. Hot smoothing irons may be used for sealing joints but in such cases, extreme care shall be exercised to avoid burning the surface.

N. Before the completion of the rolling, test the surface for thickness and contour and correct as necessary while still hot by adding or removing material, restoring and re-rolling until the finished surface complies with the test requirements.

O. The finished surface, when checked with a 10-foot straight edge placed parallel to the centerline, shall show no variation more than 1/4-inch for base or intermediate courses, and not more than 1/8-inch for surface courses.

P. Remove and replace defective portions of the completed base or surface course with suitable materials at no additional expense to the Owner.

3.07 CURB AND GUTTER

A. Construct curb and gutter on a prepared sub-base, in accordance with these Specifications and the details as shown on the Drawings.

B. The sub-grade shall be free of organic materials, soft clay, spongy material, or any other objectionable material. Prepare the sub-grade in accordance with the section on base course and to a proper shape to conform to the accepted cross sections and grade.

C. Provide concrete forms of wood or metal, straight, free from warps or kinks and of sufficient strength. Stake forms securely to resist the pressure of the concrete without spring. Prior to placing concrete, bring the forms to the true approved line and grade and keep them aligned until the concrete has set. Where a face form for a curb is used, it shall be so designed as to permit it to be securely fastened to the other forms.

D. Moisten the sub-grade prior to placing concrete. Place the concrete, mixed to the proper consistency, in the forms and tamp thoroughly so that all honeycombing will be eliminated, and sufficient mortar will be brought to the surface. Bring the concrete to a smooth, even finish by means of wood float or trowel.

E. Spade all faces adjacent to the forms so that after forms are removed, the surfaces will be smooth, even, and free of honeycomb. Tool all edges round.

F. Place 3/4-inch expansion joints at intervals not to exceed 60 feet or as shown on the Drawings. Score the concrete to a depth equal to one-third (1/3) the total depth of the concrete at intervals of not greater than 10 feet or less than 5 feet unless otherwise shown on the Drawings.

G. Protect concrete from curing too rapidly. When curb and gutter or swale sections are completed, spray them with a concrete curing compound or keep them moist by using wet burlap for a period of three (3) days. Keep the surface thoroughly damp between the completion of the finishing operations and the application of the curing compound.

H. Backfill the curb and gutter immediately after removing the forms. Backfill with selected material, placed, and compacted in layers not to exceed 4 inches in depth.

3.08 CONCRETE DITCH PAVING

A. Excavate the ditch subgrade to the required depth. Remove all soft or yielding material and replace it with suitable material, thoroughly compacted.

B. Provide concrete forms that are clean, oiled, free from warps, sufficiently strong to maintain alignment, and securely staked and braced. Spade or vibrate the concrete to prevent honeycomb and finish with a wood float. Round all edges with a 1/4-inch edger.

C. Tool transverse contraction joints with a 1/4-inch jointer or saw cut joints at intervals not greater than 5 feet measured longitudinally along the flow line.

D. Install an expansion joint at each structure with a space of not less than 1-inch left between the paving and the structure. Fill the space with a poured bituminous joint filler. Maximum spacing of expansion joints shall be 50 feet and at all structures.

3.09 CONCRETE WALKS

A. Excavate the sidewalk subgrade to the required depth. Remove all soft and yielding material and replace it with suitable material, thoroughly compacted with approved mechanical equipment.

B. Provide concrete forms that are clean, oiled, sufficiently strong to resist springing, and securely staked and braced.

C. Place concrete on wetted subgrade, compacted and finished with a wood float. Lightly broom the sidewalk concrete and round all edges with a 1/4-inch edger

D. Tool transverse contraction joints with a 1/4-inch jointer or saw cut joints at intervals not greater than 4 feet measured along the length of the sidewalk.

E. Install a 1/2-inch expansion joint at intervals at 50 feet and at the intersection with all fixed structures. Install bituminous preformed expansion joint material as the concrete is placed and seal the joint.

F. Grade and construct the concrete walk so that it is flush with the adjacent finished grade and such that drainage will pass unimpeded across the sidewalk.

3.10 AREA FILL

A. Place excess material obtained through the excavation of the required street grading in the on-site area shown on the grading plan, in a disposal area off-site, or as directed by the Engineer. Clear and grub the area prior to applying fill. The fill shall be applied in lifts not to exceed 8-inch and compacted to a density of 95 percent (95%) density.

3.11 TOPSOIL

A. Prior to commencement of work, strip and stockpile the topsoil from all areas to be disturbed by street or drainage construction. Spread, disk, and lightly roll topsoil over all graded areas after the installation of structures.

B. Apply seed, fertilizer, and mulch in accordance with Section 02920, Seeding.

END OF SECTION

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SECTION 02510

WATER DISTRIBUTION

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment, and incidentals required to install and test water mains and water services, including all appurtenances.

B. The work of this section includes installation of potable and pressurized process water lines.

1.02 MATERIALS COMPLIANCE WITH AIS

A. P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), includes an “American Iron and Steel (AIS)” requirement in section 436 that requires Clean Water State Revolving Loan Fund (CWSRF) and Drinking Water State Revolving Loan Fund (DWSRF) assistance recipients to use iron and steel products that are produced in the United States for projects for the construction, alteration, maintenance, or repair of a public water system or treatment works. This Project meets the definition of such work, and the Environment Protection Agency (EPA) implementation requirements for this AIS requirement are outlined within the DWSRF memorandum titled “Implementation of American Iron and Steel provisions of P.L. 113-76, Consolidated Appropriations Act, 2014” included as part of the RLF Supplemental General Conditions.

B. All parties are required to comply with these requirements and to ensure that all qualifying iron and steel products used in this project must be produced in the United States. See RLF Supplemental General Conditions for additional details.

1.03 RELATED SECTIONS

A. Section 01666 – Testing of Pipelines

B. Section 02315 – Excavation, Trenching and Backfilling

C. Section 02501 – Pavement and Drainage Improvements

D. Section 02516 – Ductile Iron Pipe and Fittings

E. Section 02517 – Polyvinyl Chloride (PVC) Pressure Pipe

F. Section 02640 – Valves, Hydrants and Appurtenances

G. Section 02920 – Seeding

H. Section 03300 – Cast-in-Place Concrete

1.04 REFERENCE STANDARDS

A. American Society of Mechanical Engineers (ASME), latest edition:

1. ASME B2.1 Pipe Threads (Except Dryseal)

B. ASTM International (ASTM), latest edition:

1. ASTM A48 Standard Specification for Gray Iron Castings
2. ASTM A438 Standard Test Method for Transverse Testing of Gray Cast Iron
3. ASTM A536 Standard Specification for Ductile Iron Castings
4. ASTM B88 Standard Specification for Seamless Copper Tubing
5. ASTM C33 Standard Specification for Concrete Aggregates
6. ASTM D1784 Standard Classification System and Basis for Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
7. ASTM D1785 Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120
8. ASTM D2241 Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)
9. ASTM D2737 Standard Specification for Polyethylene (PE) Plastic Tubing
10. ASTM F441 Standard Specification for Chlorinated Polyvinylchloride (CPVC) Plastic Pipe, Schedules 40 and 80

C. American Water Works Association (AWWA), latest edition:

1. AWWA C104 Cement Mortar Lining for Ductile-Iron Pipe and Fittings
2. AWWA C110 Ductile-Iron and Gray-Iron Fittings
3. AWWA C111 Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
4. AWWA C151 Ductile-Iron Pipe, Centrifugally Cast
5. AWWA C153 Ductile-Iron Compact Fittings
6. AWWA C500 Metal-Seated Gate Valves for Water Supply Service
7. AWWA C502 Dry-Barrel Fire Hydrants
8. AWWA C600 Installation of Ductile-Iron Mains and Their Appurtenances

9. AWWA C651 Disinfecting Water Mains

10. AWWA C700 Cold-Water Meters – Displacement Type, Bronze Main Case

11. AWWA C900 Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 60 In. (100 mm Through 1,500 mm)

12. AWWA C905 Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 14 In. Through 48 In. (350 mm Through 1,200 mm) *[AWWA has designated C905 as obsolete]*

D. National Sanitation Foundation /NSF), latest edition:

1. NSF 61 Drinking Water System Components - Health Effects

2. NSF 372 Drinking Water System Components – Lead Content

1.05 SUBMITTALS

A. Submit shop drawings and product data in accordance with Section 01300, Submittals for Engineer's review.

B. Submit a tabulated laying schedule that references stations and piping elevations as shown on the Drawings as well as all fittings, bends, outlets, restrained joints, tees, special deflection bells, adapters, solid sleeves and specials, along with the manufacturer's drawings and specifications indicating complete details of all items. The laying schedule shall show pipe class, class coding, station limits and transition stations for various pipe classes. Submit laying schedule to the Engineer for approval before manufacture and shipment. The location of all pipes shall conform to the locations indicated on the Drawings.

C. Submit anticipated production and delivery schedule.

D. Prior to shipment of pipe, submit a certified affidavit of compliance from the manufacturer stating that the pipe, fittings, gaskets, linings and exterior coatings for this project have been manufactured and tested in accordance with AWWA and ASTM standards and requirements specified herein.

1.06 QUALITY ASSURANCE

A. Furnish all pipe and fittings from manufacturers experienced in the manufacture of the items. It is not necessary that a single manufacturer furnish all the pipe and fittings, provided that the pipe and fittings are all compatible. Design, construct and install all piping systems and appurtenances in accordance with the best practices and methods, and suitable for the intended service.

B. Inspect and test all pipe and fittings at the factory as required by the standard manufacturing specifications.

C. The Owner may elect to hire an independent testing laboratory, at the Owner’s expense, to inspect all pipe and fittings at the plant for compliance with these Specifications.

D. The Engineer or other representative of the Owner may inspect the pipe and fittings after delivery. The pipe will be subject to rejection at any time because of failure to meet any of the Specification requirements, even though sample pipes may have been accepted as satisfactory at the place of manufacture. The Engineer will mark pipe rejected after delivery for identification, and the Contractor shall remove the pipe from the project.

E. Permanently mark all pipe and fittings with the following information:

1. Manufacturer and date
2. Size, type, class, or wall thickness
3. Standard produced to (AWWA, ASTM, etc.)

1.07 DELIVERY, STORAGE, AND HANDLING

A. Comply with Division 1 Product Requirements.

B. Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.

C. Exercise care in loading, transporting, and unloading to prevent injury to the pipe or coatings. Under no circumstances shall pipe joints or fittings be dropped or skidded against each other. Use padded slings, hooks, or pipe tongs to prevent damage to the external surface coating or internal lining of the pipe.

D. Store materials protected from damage and exposure to harmful weather conditions. Keep the interior of all pipe, fittings, and other appurtenances free from dirt or foreign matter.

E. Do not stack pipe higher than the limits recommended by the pipe manufacturer. Keep the bottom tier off the ground on timbers, rails, or concrete.

1.08 COORDINATION

A. Coordinate the work of this Section with the work of other sections. Verify at the site both the dimensions and work of other trades adjoining items of work in this Section before commencement of items herein specified.

B. Furnish to the pertinent trades all items included under this Section that are to be built into the work of other sections.

C. Do not disrupt service to water customers during installation of the water line improvements except for the time required to make connections to new main as specified in this specification. Contractor shall notify the owner at least 5 days in advance of any service disruptions.

D. The Contractor shall notify the City of Bentonville at least 48 hours prior to scheduled connections of mains. Scheduling shall be subject to the approval of the Water Department and the Engineer.

E. All connections to or any operations of appurtenances to the existing distribution system must be accomplished in the presence of the city inspector or department representative.

F. The Contractor shall schedule the sequence of construction and change as follows:

1. Install new mains as shown on the Drawings, including fire hydrants.

2. Connect new mains to system as shown on the Drawings.

3. Test, disinfect and sample mains as specified. After samples are approved, place mains into service.

G. Work may proceed on one (1) or more lines simultaneously; however, once work has commenced on any given line, the Contractor shall continue that construction until its completion.

H. The Contractor shall vary the sequence of construction as directed by the Engineer.

1.09 FIELD MEASUREMENTS

A. Take field measurements at the site to verify or supplement indicated dimensions and to ensure proper coordination of all other construction items.

PART 2 PRODUCTS

2.01 GENERAL

A. All materials and construction methods shall conform to these specifications and with the standards referenced herein. Manufacturer shall furnish certification of compliance with the referenced standards.

B. All materials and components in potable (drinking) water systems shall comply with the federal definition of “lead free” and the requirements of Public Law 111-380 titled “Reduction of Lead in Drinking Water Act”. Materials and components shall show certification in accordance with NSF Standard 61, Annex G or NSF Standard 372.

2.02 WATER DISTRIBUTION PIPE

A. Unless otherwise indicated on the Drawings, potable and process water distribution lines shall be constructed of Class 350 ductile iron pipe with restrained push-on joints, cement lining, bituminous exterior coating, polyethylene wrap, and conforming to AWWA C111 and C151. See Section 02516, Ductile Iron Pipe and Fittings.

2.03 PVC PIPE

A. Polyvinyl chloride (PVC) pressure pipe, 4-inch and larger: Push-on joint, conforming to AWWA C900; cast iron outside diameter; elastomeric-gasket type joints with integral bell; and minimum pressure Class 150 unless otherwise specified on the plans or in the specifications.

B. Polyvinyl chloride (PVC) pressure pipe, 2-inch to 3-inch: Push-on joint, conforming to ASTM D2241; elastomeric-gasket type joints with integral bell; and minimum pressure Class 200 unless otherwise specified on the plans on in the proposal.

C. Polyvinyl chloride (PVC) pressure pipe, 1/2-inch to 1 1/2-inch: Type I, Grade 1 PVC 1120 compounds; conforming to ASTM D1784, Cell Class 12454-B and ASTM D1785; and Schedule 80 unless otherwise specified on the plans or in the proposal.

D. Chlorinated polyvinyl chloride (CPVC) pressure pipe: Type IV, Grade 1 CPVC 4120 compounds; conforming to ASTM D1784, Cell Class 23447 and ASTM F441; and Schedule 80 unless otherwise specified on the plans or in the proposal.

2.04 FITTINGS

A. Fittings: Ductile-iron, cement lined, bituminous exterior coated, polyethylene wrapped, conforming to AWWA C110 or C153 (compact fittings); pressure Class 350 unless otherwise specified on the Drawings. Furnish and install restrained push-on or restrained mechanical joint fittings unless otherwise designated on the Drawings.

B. Furnish mechanical joints with anchor fittings or restrained glands if specified on the plans or in the proposal. Design restrained glands suitable for use with the pipe material, similar and equal to Megalug retainer glands as manufactured by EBAA Iron Sales, Inc.

2.05 SERVICE LINES

A. Water service line shall be as shown on the Drawings and shall be either copper or plastic tubing. Copper tubing shall be in accordance with ASTM B88, "Seamless Copper Water Tubing". All copper pipe shall be type K suitable for flared fittings.

B. Flexible plastic tubing shall be manufactured of polyethylene plastic and in accordance with ASTM D2737, "Polyethylene (PE) Plastic Tubing". The outside diameter of all plastic tubing shall be same as copper tubing. All plastic tubing shall be capable of maintaining a pressure of 200 psi at 23 degrees C for 1,000 hours, shall have a minimum working pressure rating of 200 psi, and shall be approved by the National Sanitation Foundation. If compression fittings are used on plastic tubing, stainless steel stiffener inserts shall be used at each end.

2.06 SERVICE METERS

A. Service meters 4 inches and smaller shall conform to AWWA C701 Class II and be OMNI T^2 by Sensus or approved equal. Service meters larger than 4 inches shall conform to AWWA C703 Class II and be OMNI F^2 by Sensus or approved equal.

2.07 SERVICE METER BOXES AND YOKES

A. Water meters 5/8 inch and 1 inch shall be installed in 18-inch Carson Industries Oldcastle Plastic Meter Box Part #C22002001 that are domestically manufactured, or as approved by the Bentonville Water Utilities Department. Covers shall be cast iron touch read covers, East Jordan #32197099 (single set), or #32197200 (double set) that are domestically manufactured, or as approved by the Bentonville Water Utilities Department.

B. Water meters 5/8 inch and 1 inch that are installed in non-deliberate and incidental traffic shall be installed with a load bearing meter tile. Water meter installations that fit this criteria will use the DFW Plastics #DFW1800F-18-1ET load rated meter tile. Prior approval for water meters installed in potential traffic loaded areas shall be obtained from the Bentonville Water Utilities Department during the plan review process.

C. 2-inch meters shall be installed in 30 inch outside diameter by 36-inch deep HDPE meter boxes, East Jordan #38003036, that are domestically manufactured, or as approved by the Bentonville Water Utilities Department. Covers shall be cast iron touch read covers, East Jordan #32143006 with #32243000 outer ring, that are domestically manufactured, or as approved by the Bentonville Water Utilities Department. Meter box and outer ring may be ordered together as East Jordan #32243000A05.

D. All meter vault plans and installations shall be approved by the Bentonville Water Utilities Department prior to the start of construction. Meter vaults shall not be subject to flooding and shall be watertight to prevent intrusion of water and dirt. The walls of the vault shall extend above finished grade a minimum of 3 inches to prevent intrusion of water or dirt. Vault to be installed per City of Bentonville Water Utilities Standard Detail W12.

E. The following meter setters and meter connection fittings shall conform to AWWA C800 and be those manufactured by the following companies, or approved equal:

DESCRIPTION	SIZE	CATALOG NUMBER	MANUFACTURER
Meter Set w/o Dual Check*	5/8”x3/4”x7”	B-2404FN 20-207WXLL 33	Mueller A.Y. McDonald
Meter Set w/o Dual Check*	1”x10”	B-2404FN 20-207WXLL 33	Mueller A.Y. McDonald
Meter Set w/o Dual Check (telescoping)**	2”x17”	720R712KWFF775 VBB77-12HB-11-77-EXP-NL	A.Y. McDonald Ford
Meter Set w/o Dual Check (non-telescoping)	2”x17”	720B712WWFF775 VV7712B-1177NL	A.Y. McDonald Ford

*All 5/8 inch and 1 inch meter sets shall be installed with Mueller End Connection #H-14222N and Mueller End Connection #H-14227N or A.Y. McDonald equal. A fiber washer Mueller #H-48234 or A.Y. McDonald equal shall be set in each end connection of the meter set.

**All new installations of 2-inch services by contractors shall be telescoping setter unless approved in writing by the Bentonville Water Utilities Department during plan review or construction.

2.08 SERVICE PRESSURE REDUCING VALVES (NOT USED)

2.09 CORPORATION STOPS AND SERVICE SADDLES

A. Corporation stops shall conform to AWWA C800 and shall be those manufactured by the company specified, or approved equal, as follows:

DESCRIPTION	SIZE	CATALOG NUMBER	MANUFACTURER
300 Ball Type Corporation Valve	1”	B-25008N 74701BQ 1	Mueller A.Y. McDonald
Valve Ball	1”	FB11-444NL 76101 1	Ford A.Y. McDonald
Valve Ball	2”	B-11-777SWM-NL 76101W 2	Ford A.Y. McDonald

B. Service saddles body shall be cast malleable or ductile iron or cast bronze and shall be tapped for AWWA thread. A neoprene gasket shall be cemented in place to saddle body. The saddle shall have either a single or double strap. Saddle straps shall be flattened to increase bearing surface on the pipe and shall be galvanized, cadmium plated or stainless steel, and shall be Smith-Blair 311 or 313, Mueller or approved equal.

2.10 MISCELLANEOUS FITTINGS

A. Couplings for joining sections of pipe shall be manufactured of gray cast iron in accordance with ASTM A48 or A438. Flanges may be of malleable iron conforming to ASTM A48 or of ductile iron conforming to ASTM A536. Gaskets shall be of a permanent and set resistance material. Bolts shall conform to AWWA C111.

B. Adapters for connecting pipes of dissimilar materials shall be manufactured of gray cast iron in accordance with ASTM A48 and A438. Flanges may be of fine-grained malleable iron conforming to ASTM A48 or of ductile iron conforming to ASTM A536. Gaskets shall be of a natural rubber compound that will provide permanence and resistance to set. Bolts for adapters shall be high strength steel or iron and shall be galvanized.

C. Repair clamps shall be made of stainless-steel Type 302 or 304, or of gray iron conforming to ASTM A48 and A438. Gaskets shall be of a natural rubber compound that will provide permanence and resistance to set. Bolts and nuts shall be high strength steel or iron and shall be coated and treated for corrosion protection. Repair clamps shall be of full circle design and shall have adequate length to properly repair line defects and thereby prevent future leakage at the repaired point.

D. Miscellaneous fittings and adapters for service lines shall be wrought copper, cast bronze or brass.

2.11 GRAVEL BEDDING

A. The granular fill used as gravel bedding shall be crushed stone, crushed gravel or gravel. The materials shall be well graded containing several sizes of particles ranging up to a 3/4-inch maximum size. Unless otherwise approved by the Engineer, the material shall meet the gradation requirements of a modified ASTM C33, Gradation 67 with a maximum aggregate size of 3/4-inch.

2.12 CONCRETE

A. Concrete shall be 2500 psi, unless noted otherwise. See Section 03300, Cast-in-Place Concrete.

2.13 MAIN LINE PRESSURE REDUCING VALVES (NOT USED)

PART 3 EXECUTION

3.01 TRENCH EXCAVATION AND BACKFILL

A. General: Refer to Section 02315, Excavation, Trenching and Backfilling.

3.02 PIPE INSTALLATION

A. General: Refer to Section, 02516 Ductile Iron Pipe and Fittings, for the installation requirements for Ductile Iron Pipe and Section 02517 for the installation requirements of PVC Pressure Pipe.

B. No water main shall be less than 8 inches in diameter unless prior approval is obtained in writing from the Bentonville Water Utilities Department. The minimum cover over water mains 8-inches and less shall be 4 feet. Mains larger than 8 inches shall have a minimum cover of 5 feet.

C. Concrete Thrust Blocking

1. Install concrete thrust blocking at the locations shown on the Drawings. Place the concrete between solid, undisturbed ground and the fitting to be anchored. The excavation shall be hand shaped and free of loose material. Forms shall be used to confine the concrete in areas other than that part that is in contact with undisturbed soil in the direction of the thrust. Care shall be taken to place the thrust block such that the pipe and fitting joints will be accessible for repair, and shall not interfere with the removal of any joint accessories such as bolts, followers, threads, collars, or couplings. Fire hydrant weep hole drain outlets shall not be restricted. No thrust blocks shall be less than 12 inches thick between the pipeline or appurtenances and undisturbed soil in the direction of thrust.

2. All concrete shall have a 28-day compressive strength of 4,000-PSI. Admixtures are not to be used without approval of the Owner and Engineer.

3. The shape and contact area of the concrete thrust blocks shall be as shown on the Drawings and as directed by the Engineer. The contact area of backing shall be as required to prevent movement of the joint, but in no case shall the contact area be less than one square foot. Forms shall be used to confine the concrete in areas other than that part that is in contact with undisturbed soil in the direction of the thrust.

4. All placement of concrete must be in the presence of the Owner or Engineer. The Contractor may be required to remove, without compensation, any concrete placed in the absence of the Owner or Engineer.

5. Backfill over concrete thrust blocks or anchor collars shall not be placed before the concrete has attained initial set.

6. Concrete thrust blocks or anchor collars that fail to restrain the pipe or appurtenances shall be replaced by the Contractor at no expense to the Owner.

7. The excavation shall be free of water before concrete is placed. Steel reinforcement, as specified on the plans, shall be placed in accordance with Section 13.5 in the Bentonville Water Utilities Department Specifications, 2024 Edition.

8. The pipe or appurtenances shall be cleaned before placing concrete when the concrete is to be in direct contact with the pipe or appurtenance. Polyethylene plastic shall cover all pipes or appurtenances subject to direct contact with concrete.

9. The area of contact of the thrust blocks and anchor collars shall be sufficient to resist the thrust. This area will vary depending on the safe bearing value of the soil. Refer to Section 13.9.11 in the Bentonville Water Utilities Department Specifications, 2024 Edition, for the suggested safe soil bearing values requirement table. The values referenced are approximate and will vary considerably and are intended to be used only as a reference. The Contractor is responsible for determining the soil bearing value or taking other action to assure that the bearing area is adequate to restrain the pipe or appurtenances.

10. Where the soil is unstable or in the case of recent fill areas, the following procedures shall apply either individually or in a combination:

    a. Thrust blocks shall be of adequate size to restrain pipe or appurtenances by mass alone without depending on horizontal bearing of the soil.

    b. The excavation shall extend deep enough to contact firm soil and the block brought up to the pipe or appurtenances and constructed so that the block acts as a beam and will provide restraint required. Such block shall be reinforced with steel reinforcing bars, as shown in the standard details within the construction plans.

    c. Anchor blocks shall be constructed in a firm soil and tie rods extended to the pipe or appurtenances, as shown in the standard details within the construction plans.

11. Thrust blocks for vertical bends shall be adequate to resist the thrust by mass alone when the thrust is upward.

12. Thrust blocks and anchor collars shall be adequate to restrain the pipeline and appurtenances at the specified test pressure. The following table lists the resultant thrust at certain fittings at a pressure of 100 psi. In order to determine the thrust at the test pressure these values are to be multiplied by a factor equal to the test pressure divided by 100. Refer to Section 13.10 in the Bentonville Water Utilities Department Specifications, 2024 Edition, for the thrust blocking pressure requirement table.

D. Connections to Mains

1. Connect new water mains to existing mains as shown on the Drawings.

2. Prior to valving off the existing main, assemble all equipment and fittings before excavating and exposing the main. Coordinate closing and opening of valves with the Bentonville WRRF staff. Connect to the new main using adapters and fittings specified. Bedding, backfilling, concrete blocking, and other related items shall be as specified in other sections of this specification.

3. The main shall be connected and a corporation stop installed near the point of connection to permit expelling air from the line. Installation of the tap shall be as directed by the Engineer.

4. In areas where the static operating water pressure is 150psi or greater or installation of water mains are within 10’ of any permanent structure the Owner reserves the right to require ductile iron water piping be installed.

5. All taps 12-inches or smaller on existing mains shall be performed by the Bentonville Water Utilities Department. Taps larger than 12-inches must be completed by a Bentonville Water Utilities Department approved contractor. Request for taps to be performed by the Bentonville Water Utilities Department or approved contractor shall be made at least 24 hours in advance. The Contractor shall provide material for all taps and shall be responsible for excavation and installation of valve and tapping sleeves unless directed otherwise by the Bentonville Water Utilities Department. The Contractor shall provide two pressure tests prior to execution of the tap. Two pressure tests, as defined herein, at 200 psig with no loss for 15 minutes or in areas of higher-pressure test to 1.5 times the operating pressure with no loss for 15 minutes and shall be witnessed and recorded by a City of Bentonville Inspector or Bentonville Water Utilities Department representative. The first pressure test shall be with the valve closed and without a test plug, and the second pressure test shall be with the valve open and a test plug. Testing equipment shall be inspected by a City of Bentonville Inspector and shall be in proper working order at time of test. Tap locations on pipe sizes 6 inches to 12 inches will be no closer than 24 inches to the back of the bell or collar of the pipeline and no closer than 24 inches from the insertion line on the spigot end of the pipeline. Water lines larger than 12-inches, tap locations will be no closer than 36-inches.

3.03 SERVICES

A. Service Taps and Service Lines

1. Service taps shall be made by installation of corporation stops and service saddle on the water mains. Taps shall be made between fifteen-degrees and thirty-degrees (15° and 30°) from the horizontal.

2. Place service lines to the line and grade shown on the Drawings or as established by the Engineer. Place service lines at right angles to the water main. Lay service lines to a minimum depth of 18 inches below the finish ground surface, except at street crossings where the minimum cover below subgrade shall be 30 inches. Full

lengths of tubing shall be used; no splices shall be installed between the service tap and the water meter.

3. The trench shall have a minimum width of 6 inches and a trench bottom free of rocks or boulders. The bottom of the trench shall be flat, smooth, and even to provide a surface with a uniform bearing for the pipe.

4. The minimum cover over water services shall be 24 inches or as approved by the Bentonville Water Utilities Department.

5. If rock is encountered in the bottom of the trench, it shall be removed and a minimum bedding depth of 4 inches provided between the trench bottom and the service line pipe. Fill the excavated area below the grade line with sand or select material free of rocks, boulders, debris of any kind, or other objectionable matter, or material that may be injurious to the pipe. Tamp the bedding material prior to installation of the pipe.

6. Place and tamp the backfill material in layers not exceeding 4 inches in thickness. Use only backfill material that is free from stones, rocks, and clods and is not frozen. Tamp the backfill uniformly along the full length of the pipe to a point 4 inches above the top of the pipe. The backfill densities shall be the same as those specified in other Sections of the specifications depending upon the location of the service line.

7. Service lines extending beneath existing pavements, which are to remain in place, shall be installed by boring or other subsurface method. The method used shall be approved by the Engineer and shall be a method that will avoid subjecting the service tubing to excessive stress. If obstructions are encountered and installation of a service line cannot be accomplished by boring, the service line shall be installed by the open trench method. Cutting and replacement of existing pavements shall be as specified in other Sections of this specification.

8. Tubing shall be connected using the specified fittings and in such a manner to avoid excessive stress on the line.

B. Service Meters: Install water service meters and meter boxes as shown on the Drawings and as directed by the Engineer. Install meter boxes with the top of the box flush with the sidewalk surface. The meter and yoke shall be approximately centered within the box.

3.04 STREET CROSSINGS (NOT USED)

3.05 DISINFECTION

A. All materials, work, workmanship, and methods shall be in accordance with the latest revision of the AWWA C651 and Section 13.15 in the Bentonville Water Utilities Department Specification, 2024 Edition.

B. Samples of water shall be taken by the Contractor as directed by the Engineer and shall be submitted for analysis by a testing laboratory certified for water bacteriological analysis in the State where the project is located. A copy of the test results shall be

furnished to the Engineer. A minimum of two (2) consecutive safe samples are required on each line section. Samples are to be collected on successive days.

C. The disinfection procedures shall be repeated as necessary until all samples indicate that the water is safe and approved by the State regulatory agency.

3.06 FILLING WATER LINES

A. Refer to the Bentonville Water Utilities Department Specifications, 2024 Edition, for necessary process information.

3.07 HYDROSTATIC PRESSURE AND LEAKAGE TESTS

A. Clean and test all piping in accordance with Section 01666, Testing of Pipelines. Submit a testing plan including detailed procedures, methods and equipment that will be used for pipeline testing at least 10 days before starting the testing for Engineer's review and approval. Furnish all necessary equipment and labor for carrying out the specified tests and conduct all tests in the presence of the Engineer.

B. The Owner will provide water for the testing of pipelines. Coordinate connection with the Owner and provide an air gap or backflow preventer. See also Section 01666, Testing of Pipelines.

C. Install and make all valves operational before testing. Provide suitable restrained bulkheads with a sufficient number of outlets for filling and draining the line and for venting air.

D. Furnish all necessary gauges, meters, pressure pumps and other equipment and test the lines in the presence of the Engineer or Engineer’s representative.

E. The leakage test may be conducted in conjunction with the pressure test but shall not be less than two (2) hours in duration. Repair and eliminate all leaks evident at the surface regardless of the total leakage as shown by the test. Repair and retest all lines that fail to meet tests as many times as necessary to achieve compliance with the testing requirements. Remove and replace all defective materials, pipes, valves, and accessories.

END OF SECTION

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SECTION 02516

DUCTILE IRON PIPE AND FITTINGS

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment, and incidentals; install, disinfect potable water lines; and test buried ductile iron pipe and fittings as shown on the Drawings and as specified herein.

B. Site piping shall include all piping and fittings extending outward, upward, and downward into the ground from the outside face of all buildings and structures. Yard piping shall include all piping in valve vaults, manholes, cleanouts, and similar yard structures.

C. Piping shall be located substantially as shown on the Drawings. The Engineer reserves the right to make modifications in piping locations and alignments to avoid interference between pipes or for other reasons. Pipe fitting notation is for the Contractor's convenience and does not relieve the Contractor from installing and jointing different or additional items where required to achieve a complete piping system.

D. Pipe or piping refers to all pipe, fittings, materials, and appurtenances required to construct ductile iron pipelines unless otherwise noted.

1.02 MATERIALS COMPLIANCE WITH AIS

A. P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), includes an "American Iron and Steel (AIS)" requirement in section 436 that requires Clean Water State Revolving Loan Fund (CWSRF) and Drinking Water State Revolving Loan Fund (DWSRF) assistance recipients to use iron and steel products that are produced in the United States for projects for the construction, alteration, maintenance, or repair of a public water system or treatment works. This Project meets the definition of such work, and the Environment Protection Agency (EPA) implementation requirements for this AIS requirement are outlined within the DWSRF memorandum titled "Implementation of American Iron and Steel provisions of P.L. 113-76, Consolidated Appropriations Act, 2014" included as part of the RLF Supplemental General Conditions.

B. All parties are required to comply with these requirements and to ensure that all qualifying iron and steel products used in this project must be produced in the United States. See RLF Supplemental General Conditions for additional details.

1.03 RELATED SECTIONS

A. Section 01300 – Submittals

B. Section 01666 – Testing of Pipelines

C. Section 02315 – Excavation, Trenching and Backfilling

D. Section 02510 – Water Distribution

E. Section 02640 – Valves, Hydrants and Appurtenances

F. Section 03300 – Cast-in-Place Concrete

1.04 REFERENCE SPECIFICATIONS

A. ASTM International (ASTM), latest edition:

1. ASTM A193 Standard Specification for Alloy-Steel and Stainless-Steel Bolting Materials

2. ASTM A194 Standard Specification for Carbon and Alloy Steel Nuts for Bolts for High Pressure and High Temperature Service, or Both

3. ASTM A674 Standard Practice for Polyethylene Encasement for Ductile Iron Pipe for Water or Other Liquids

4. ASTM A746 Standard Specification Ductile Iron Gravity Sewer

5. ASTM B2000 Standard Practices For Casting Preparation And Test Procedure Of Porcelain Enamel-Lined Pipe, Fittings, And Valves For Use In The Municipal Wastewater, Sewage, And Water Treatment Industry

6. ASTM C150 Standard Specification for Portland Cement

B. American Water Works Association (AWWA), latest edition:

1. AWWA C104 Cement Mortar Lining for Ductile-Iron Pipe and Fittings for Water

2. AWWA C105 Polyethylene Encasement for Ductile-Iron Pipe System

3. AWWA C110 Ductile-Iron and Gray-Iron Fittings, 3-In. Through 48-In. (75 mm Through 1200 mm) for Water and Other Liquids

4. AWWA C111 Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings

5. AWWA C116 Protective Fusion-Bonded Epoxy Coatings for the Interior and Exterior Surfaces of Ductile-Iron and Gray-Iron Fittings for Water Supply Service

6. AWWA C150 Thickness Design of Ductile-Iron Pipe

7. AWWA C151 Ductile-Iron Pipe, Centrifugally Cast, for Water or Other Liquids

8. AWWA C153 Ductile-Iron Compact Fittings for Water Service

9. AWWA C550 Protective Interior Coatings for Valves and Hydrants

10. AWWA C600 Installation of Ductile-Iron Water Mains and Their Appurtenances

11. AWWA C651 Disinfecting Water Mains

C. National Sanitation Foundation (NSF):

1. NSF 61 Drinking Water System Components Health Effects

1.05 SUBMITTALS

A. See Section 01300, Submittals, for submittal procedures.

B. Product Data: Provide data on pipe materials, pipe fittings and accessories. Provide design calculations confirming that piping materials meet the required installation and operational conditions. All calculations shall be prepared and sealed by a Professional Engineer registered in the State where the project will be constructed.

C. Laying Schedule: Submit a tabulated laying schedule referencing stations and piping elevations as well as all fittings, bends, outlets, restrained joints, tees, special deflection bells, adapters, solid sleeves, and specials. Include the manufacturer's detailed drawings and specifications. Show pipe class, station limits, and transition stations for various pipe classes. Submit the laying schedule to the Engineer for approval before manufacture and shipment.

D. Submit anticipated production and delivery schedule.

E. Manufacturer’s Certificate: Certify that pipe, fittings, gaskets, linings, and exterior coatings meet or exceed the specified requirements of these specifications and the referenced ASTM and AWWA standards.

1.06 QUALITY ASSURANCE

A. Furnish all pipe and fittings from manufacturers experienced in the manufacture of the items. It is not necessary that a single manufacturer furnish all the pipe and fittings, provided that the pipe and fittings are compatible. Design, construct and install all piping systems and appurtenances in accordance with the best practices and methods, and suitable for the intended service.

B. Inspect and test all ductile-iron pipe and fittings supplied for this project at the foundry as required by the standard specifications to which the material is manufactured.

C. Hydrostatically test ductile iron pipe per AWWA C151.

D. The Owner may elect to hire an independent testing laboratory, at the Owner’s expense, to inspect all pipe and fittings at the foundry for compliance with these Specifications.

E. Permanently mark all pipe and fittings with the following information:

1. Manufacturer and date
2. Size, type, class, or wall thickness
3. Standard produced to (AWWA, ASTM, etc.)

F. The Engineer or representative of the Owner may inspect the pipe and fittings after delivery. The pipe will be subject to rejection at any time because of failure to meet any of the Specification requirements, even though sample pipes may have been accepted as satisfactory at the place of manufacture. The Engineer will mark pipe rejected after delivery for identification, and the Contractor shall remove the pipe from the project.

1.07 SYSTEM DESCRIPTION

A. The piping materials specified herein are intended to be of standard types for use in transporting water or sewage, either pressurized or non-pressurized; and for use as drainpipe for buildings or other structures as noted on the Drawings.

B. Note any supplementary information listed in pipe schedules on Drawings or in this Section, especially concerning pressures, minimum thickness, etc. In case of a conflict, information given in the pipe schedule shall govern.

C. Contractor is responsible for compatibility between pipe materials, fittings, and appurtenances.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Comply with Division 1 Product Requirements.

B. Comply with manufacturer’s ordering instructions and lead time requirements to avoid construction delays.

C. Bundle or package all items in such a manner as to provide adequate protection of the ends during transportation to the site. Exercise care in loading, transporting, and unloading to prevent injury to the pipe and coatings. Do not drop or skid pipe joints or fittings against each other. Use padded slings, hooks, or pipe tongs to prevent damage to the external surface coating or internal lining of the pipe. Any pipe damaged in shipment shall be replaced as directed by the Engineer and at no additional cost to the Owner.

D. Store materials protected from damage and exposure to harmful weather conditions. Keep the interior of all pipes, fittings, and other appurtenances free from dirt or foreign matter.

E. Do not stack pipe higher than the limits recommended by the pipe manufacturer. Keep the bottom tier off the ground on timbers, rails, or concrete.

F. Store gaskets for mechanical and push-on joints in a cool location out of direct sunlight. Prevent contact between gaskets and petroleum products. Use gaskets on a first-in, first-out basis.

1.09 COORDINATION

A. Coordinate the work of this Section with the work of other sections. Verify at the site both the dimensions and work of other trades adjoining items of work in this Section before commencement of items herein specified.

B. Furnish to the pertinent trades all items included under this Section that are to be built into the work of other sections.

C. Do not disrupt service to utility customers during installation of the piping improvements except for the time required to make connections to a new main.

D. Notify the Public Utility Department and Engineer at least 48 hours prior to scheduled connections of mains.

E. Schedule the sequence of construction and connection as follows:

1. Install new mains, including fire hydrants
2. Connect new mains to system
3. Test, disinfect and sample potable water mains
4. Following approval of testing and disinfection (if required), place mains into service

F. Work may proceed on one or more lines simultaneously; however, once work has commenced on any given line, continue that construction until its completion.

G. Vary the sequence of construction as directed by the Engineer.

1.10 FIELD MEASUREMENTS

A. Take field measurements at the site to verify or supplement indicated dimensions and to ensure proper coordination of all other construction items.

PART 2 PRODUCTS

2.01 GENERAL

A. Unless otherwise indicated on the Drawings, water distribution (potable and process water) and force main (pressurized) piping shall be constructed of ductile iron pipe with restrained joint fittings, cement lining, and bituminous exterior coating, conforming to AWWA C104, C111, C150 and C151.

B. Water distribution and force main piping shall be constructed with one of the following methods:

1. Unrestrained push-on joint pipe, similar and equal to Fastite Joint Pipe, by American Ductile Iron Pipe, with restrained mechanical joint fittings and concrete thrust blocking. Fittings shall be standard or compact size conforming to AWWA C110 or C153, respectively.

2. Restrained push-on joint pipe, similar and equal to Fastite Joint Pipe with mechanical joint or Flex-Ring joints, by American Ductile Iron Pipe, with restrained push-on joint

or restrained mechanical joint fittings. Fittings shall be standard or compact size conforming to AWWA C110 or C153, respectively.

C. Unless otherwise indicated on the Drawings, gravity sewers and gravity process piping shall be constructed of ductile iron pipe with Protecto 401 or Perma-Shield Series 431 lining and bituminous exterior coating, conforming to AWWA C104, C111, C150 and C151.

D. Gravity process piping shall be constructed with one of the following methods:

1. Unrestrained push-on joint pipe, similar and equal to Fastite Joint Pipe, by American Ductile Iron Pipe, with restrained mechanical joint fittings plus two (2) restrained pipe lengths (i.e., 40 linear-feet) in all directions from the fitting, unless specifically noted otherwise on the drawings. Fittings shall be standard or compact size conforming to AWWA C110 or C153, respectively.

E. All buried ductile iron pipe shall be installed with polyethylene wrap conforming to AWWA C105.

2.02 MATERIALS

A. Manufacturers:

1. American Cast Iron Pipe Company or approved equal

B. Ductile Iron Pipe:

1. Conform to AWWA C151. Supply in standard lengths

2. Thickness design per AWWA C150, except provide minimum Class 50 rated at 350 psi for all piping.

3. Ductile iron pipe for gravity sewer: conform to ASTM A746.

C. Pipe Joints:

1. Ductile iron pipe shall have rubber-gasket push-on joint or rubber-gasket mechanical joint, conforming to AWWA C111. Unless otherwise noted, gaskets shall be styrene butadiene rubber (SBR). Confirm that gasket materials are compatible with the liquids to be transported and the temperature requirements. Jointing devices ANSI A21.11, rubber gasket joint devices.

2. Restrained push-on pipe joints shall use a "Flexible Ring-type" restraint system manufactured by the pipe and fitting manufacturer, and suitable for the specified test pressure.

a. Provide all pressure pipes with restrained joints
b. Provide all fittings for lines 3-in. in diameter and larger with restrained joints
c. Refer to the Drawings for required length of restrained joints

3. The Contractor may substitute a wedge action mechanical joint gland to restrain the pipe bells, similar and equal to the Megalug Series 1100 or 1700 by EBAA Iron Sales, Inc.

4. Sleeve type couplings: mechanical joint solid sleeves, Dresser Style 38 or 138, or approved equal.

5. Restrained flanged adapters: Megaflange Series 2100 by EBAA Iron Sales, Inc. Flange-Lock Series 911 by Smith Blair, or approved equal.

D. Ductile Iron Fittings:

1. Ductile iron fittings shall conform to AWWA C110 or AWWA C153 as applicable. Joints shall be mechanical joint conforming to ANSI A21.11.

2. Fittings to be manufactured by U.S. Pipe “Trim Tyte”, Tyler, Star Pipe Products, or approved equal. Any alternate manufacturer shall require owner approval prior to installation. All fittings shall be ANSI/AWWA C550 AND C116 6-8 mil Nominal Thickness Fusion Bonded Epoxy Coated inside and out.

3. Fittings shall be ductile iron, designed for working pressure of at least 350 psi, and shall conform to ANSI/AWWA C153/A21.

4. Make pipe closures with mechanical joint ductile iron solid sleeves, located in straight runs of pipe at minimum cover outside the limits of restrained joint sections. Unless specifically detailed in the Drawings, closure locations are subject to approval of the Engineer.

5. Restrain ductile iron mechanical fittings with “Wedge-type” gland similar and equal to one of the following: EBAA Iron Sales, Inc. or Ford Meter Box Co., Inc.

6. Mechanical Joint Retainer Glands for PVC shall be made from DI and shall be designed for a working pressure of at least 200 psi. The set screws shall be extended through the outer most part of the gland. Glands shall be designed to standard mechanical joint fittings (AWWA C111). Restrain PVC connections to mechanical fittings with “Wedge-type” gland similar and equal to one of the following: EBAA Iron Sales, Inc. or Ford Meter Box Co., Inc.

7. Mechanical Joint Retainer Glands shall be installed on all water line valves bends and couplings. couplings. Mechanical Joint Retainer Glands for DI shall be made from DI and shall be designed for a working pressure of at least 200 psig. The set screws shall be extended through the outer most part of the gland. Glands shall be designed to standard mechanical joint fittings (AWWA C111). The minimum number and minimum size set screws shall be as follows, or approved equal. Any alternate manufacturer shall require Department approval prior to installation. All Glands sized 6” and larger shall include 5/8” set screws. 4” glands shall require 1/2” set screw. Number of set screws shall be as shown in Section 12.9.2. of the City of Bentonville Water Utilities Department Standard Specifications, 2024 Edition.

E. Interior Lining:

1. Ductile iron pipe and fittings shall have the same type of lining as specified herein unless approved by the Engineer.

2. Potable water lines and pressurized process lines: Cement mortar lining and seal coat conforming to AWWA C104 A21.

3. As an option, the pipe supplier may line fittings in accordance with AWWA C550 and NSF 61.

4. Gravity sewer or gravity process (drains) lines: Ceramic epoxy lining, amine-cured, with a minimum thickness of 40-mils, similar and equal to Protecto 401 Ceramic Epoxy as manufactured by Vulcan Painters, Inc or Perma-Shield Series 431 manufactured by Tnemec. Provide certification that the lining was applied in accordance with the manufacturer's instructions.

5. Where designated on the plans, pipe and fittings shall be glass lined in accordance with ASTM B1000. The glass lining applied to pipe and fittings shall be hard, smooth, continuous vitreous material. The lining shall be a bright, light color and have a minimum dry film thickness of 10 mils.

6. Fusion bonded epoxy coating conforming to AWWA C116 or AWWA C550 and NSF 61.

F. Exterior Coating:

1. Ductile iron pipe and fittings shall have the same type of exterior coating as specified herein unless approved by the Engineer.

2. Asphaltic coating conforming to AWWA C110 and C151.

3. Shop prime and field paint all exterior pipe and fitting surfaces exposed in interior locations. Coat flange faces with a rust preventative compound similar and equal to Dearborn Chemical "No-Ox-Id", Rust-Oleum "R-9", or Houghton "Rust Veto 344".

4. All buried ductile iron pipe, mechanical joints of pipe and fittings, all valves and fire hydrants with mechanical joint ends and all saddles, sleeves, and couplings, tapping saddles and any other appurtenances with exposed bolts shall be installed with polyethylene wrap conforming to AWWA C105 and ASTM A674. The wrap shall consist of fused layers of low-density polyethylene film with an anti-microbial biocide and a volatile corrosion inhibitor. The wrap shall be similar and equal to V-Bio Enhanced Polyethylene Encasement.

5. Pipe-shaped appurtenances such as bends, reducers, offsets and other pipe-shaped appurtenances shall be covered with polyethylene in the same manner as the pipe.

6. Odd-shaped appurtenances such as valves, tees, crosses and other odd-shaped pieces which cannot practically be wrapped in a tube, shall be wrapped with a flat sheet or split length of polyethylene tube. The sheet shall be passed under the

appurtenance and brought up around the body. Seams shall be made by bringing the edges together, folding over twice, and taping down. Tape polyethylene securely in place at valve stem and other penetrations.

7. Where specified in the Plans, DI pipe and appurtenances shall be completely encased in polyethylene tubing material. It is not the intent that the material form an enclosure that is absolutely air or water tight, but to prevent pipe to soil contact.

8. Polyethylene tubing, when required, shall be applied to water lines by one of the following methods:

    a. Cut polyethylene tube to a length approximately 2’ longer than the length of the pipe section. Slip the tube around the pipe centering it to provide a 1’ overlap on each adjacent pipe section, and bunching it accordion fashion lengthwise until it clears the pipe ends. Lower the pipe into the trench and make up the pipe joint with the preceding section of pipe. A shallow bell hole must be made at joints to facilitate installation of the polyethylene tube. After assembling the pipe joint, take bunched polyethylene from the preceding length of pipe, slip it over the end of the new length of pipe and secure in place. Then slip the end of the polyethylene from the new pipe section of the end of the first wrap until it overlaps the joint at the end of the preceding length of pipe. Secure the overlap in place. Take up the slack width to make snug, but not tight, fit along the barrel of the pipe, securing the fold at quarter points with tape.

    b. Cut polyethylene tube to a length approximately 1’ shorter than the length of the pipe section. Slip the tube around the pipe, centering it to provide 6” of bare pipe at each end. Make polyethylene snug, but not tight; secure ends. Before making up a joint, slip a 3’ length of polyethylene tube over the end of the preceding pipe section, bunching it accordion fashion lengthwise. After completing the joint, pull the 3’ length of polyethylene over the joint, overlapping the polyethylene previously installed on each adjacent section of pipe by at least 1’; make snug and secure each end.

9. Openings for branches, service taps, blow-offs, air valves, and similar appurtenances shall be made by making a x-shaped cut in the polyethylene and temporarily folding the film back. After the appurtenance is installed, tape the slack securely to the appurtenance and repair the cut, as well as any other damaged areas in the polyethylene with tape.

10. Where polyethylene wrapped pipe joins a pipe, which is not wrapped, extend the polyethylene tube to cover the unwrapped pipe a distance of at least 2’ and secure the end.

11. The polyethylene material shall be secured around the pipe and appurtenances by at least 3 circular wraps of tape. Tape for field application shall be Polyken #900, or Scotchrap #50, or equal, at least 2” wide.

12. All tongs, cables or chains that are used for lifting pipe and appurtenances that have been encased in polyethylene material shall be adequately padded to prevent damage to the material.

13. Repair any rips, punctures, or other damage to the polyethylene with tape or with a short length of polyethylene tube cut open, wrapped around the pipe and secured in place.

14. Polyethylene material shall be stored on the job site in such a manner that it is not exposed to direct sunlight. Exposure during installation shall not exceed 48 hours.

15. Backfill material shall be the same as specified for pipe without polyethylene wrapping. Special care shall be taken to prevent damage to the polyethylene wrapping when placing backfill. Backfill material shall be free from cinders, refuse, boulders, rocks, stones and/or other material that could damage polyethylene.

2.03 DUCTILE IRON PIPE DESIGN

A. Ductile iron pipe shall have a minimum tensile strength of 60,000 psi with minimum yield strength of 42,000 psi. Design for external and internal pressures separately using the larger of the two for the net design thickness. Include service allowance and casting tolerance per AWWA C150.

B. The pipe classes determined for various sizes and conditions shall provide the total calculated thickness at a minimum or conform to minimum pipe class specified elsewhere in this Section, whichever is greater.

C. Net thickness design for external loading shall be taken as the greater of the following conditions:

1. Depth of cover: 30-in. minimum with AASHTO H-20 wheel loads, and an impact factor of 1.5

2. Depth from existing ground level of future proposed grade (whichever is greater) to top of pipe as shown on the Drawings, with truckload

3. Soil Density: 120 pounds per cubic foot

4. Laying Conditions: AWWA C150, Trench Type 4

D. Net thickness design shall be based on the following internal pressure conditions:

1. Design pressure: 125 psi. (pressurized piping) or 25 psi (non-pressurized piping)

2. Surge allowance: 100 psi

3. Safety factor: 2

4. Total internal pressure design: 2 (125 + 100) = 450 psi for pressurized piping

E. Furnish copies of design calculations in accordance with Section 01300, Submittals.

2.04 TRACER WIRE

A. All pipe, both buried and encased, shall be installed with tracer wire. Tracer wire shall be single 10-gauge type TW (single strand) insulated copper tracer wire and shall be terminated in tracer wire boxes at the locations shown on the Drawings. Tracer wire shall be located on top of pipe and buried with pipe. All tracer wire shall be installed in conjunction with the pipe at the same depth as the pipe. Tracer wire junction boxes shall be installed at intervals shown on the Drawings, but not exceeding 1,000 feet unless specifically authorized by the Engineer.

B. Tracer wire shall not be connected in any way to main or any other underground metal (except other tracer wires). Installation of locator wire shall be tested 1 time before the 1st acceptance inspection. Tracer wire shall be tested after curbs are installed and prior to asphalt.

C. Wire shall be accessible at all valve boxes and meter boxes and shall extend a minimum of 6” above the valve or meter box, at the main or service. Connect all locator wires together so that a continuous electrical path is ensured. Tracer wire shall be installed through the outside of the valve box bottom section then inserted through the inside of the top section of the valve box. A minimum of 6” to maximum of 12” of tracer wire is required to be extended beyond the top of the valve box.

D. To connect locator wires, the wires shall be spliced using a split bolt connector (Blackburn 9H or Kearney KS90) or equal, then covered with electrical plastic tape (Type 3M Scotch 33) so that a waterproof joint is made.

E. Tracer Wire valve boxes shall be Tyler 6850 series or equal with 5 ¼" shafts, screw type, and 5 ¼" drop lid with “WATER” or “SEWER” on a cast iron lid. All valve box material shall be domestically made. The tracer wire valve box extension shall be C900 Class 235 (DR 18) PVC.

F. Tracer Wire valve boxes shall be located no further than 500 feet and placed at every angle change in direction along force mains.

2.05 SLURRY BACKFILL

A. See Section 02315, Excavation, Trenching and Backfilling, for specifications on Slurry Backfill.

PART 3 EXECUTION

3.01 GENERAL

A. Exercise care in loading, transporting, and unloading to prevent injury to the pipe or coatings. Do not drop pipe or fittings.

B. Examine all pipe and fittings for soundness before laying, and do not install defective pieces. Repair damaged pipe coatings per manufacturer's recommendations.

C. Remove any defective pipe discovered after laying and replace with sound pipe in a satisfactory manner.

3.02 INSTALLING DUCTILE IRON PIPE AND FITTINGS

A. Install ductile iron pipe and fittings in accordance with AWWA C600, except as otherwise provided herein. Provide a firm, even bearing throughout the length of the pipe by digging bell holes at each joint and by tamping backfill materials at the side of the pipe to the springline per details shown on the Drawings.

B. Thoroughly clean all pipe and fittings before laying. When laying is not in progress, close open pipe ends with a watertight plug or other approved means. Place sufficient backfill to prevent flotation. Do not exceed 75-percent (75%) of the allowable joint deflection recommended by the manufacturer.

C. Provide a minimum of 30-in. of cover over all ductile iron pipe unless otherwise specified or shown on the Drawings. Lay pipe such that the invert or centerline elevations shown on the Drawings are not exceeded.

D. Provide fittings in addition to those shown on the Drawings where required, and when making elevation changes to cross existing buried utilities. Install solid sleeve closures at locations approved by the Engineer.

E. Maintain a dry and broom-clean pipe interior throughout the construction period.

F. Cut pipe sections with a machine, leaving a smooth cut at right angles to the axis of the pipe. Bevel pipe ends for insertion in a bell to conform to the manufactured spigot end. Repair damaged cement lining and seal field-cut pipe ends with Protecto 401 Joint Compound or Perma-Shield Series 431 (or approved epoxy for potable water) in accordance with manufacturer's instruction.

G. The method of restraining field cut pipes shall be approved by the Engineer. The restraint system shall incorporate restrainer glands by EBBA Iron or the pipe manufacturer’s field adaptable restraint system. The pipe laying schedule shall include details of the proposed restraint system.

H. Jointing Ductile-Iron Pipe

1. Install push-on joints in accordance with manufacturer's instructions and AWWA C600. Lay pipe with bell ends looking ahead. Clean joint surfaces and insert a rubber gasket in the groove of the pipe bell. Lubricate the plain end of the pipe, align with the adjacent pipe bell, and push home.

2. Assemble mechanical joints in accordance with the manufacturer's instructions and AWWA C600. Lay pipe with bell ends looking ahead. Clean and lubricate joint surfaces and the rubber gasket, align pipe with the adjacent bell, and push home. Tighten bolts to the specified torque. Under no condition shall extension wrenches or a pipe over an ordinary wrench handle be used to secure greater leverage.

3. Tighten bolts in mechanical or restrained joints alternately and evenly.

4. Install restrained joints in accordance with manufacturer's instructions.

I. Install polyethylene encasement around ductile iron pipe to limits shown on the Drawings and in accordance with pipe manufacturer's recommendations.

J. Refer to Section 02510 Water Distribution concrete thrust blocking requirements.

K. Install all blow-offs, outlets, valves, fittings, and other required appurtenances as indicated on the Drawings and in accordance with the manufacturer's instructions.

3.03 CONNECTIONS TO STRUCTURES

A. Wherever a 3-in. or larger pipe passes horizontally through concrete to earth, install two flexible joints, spaced from 2 to 4-ft. apart depending on pipe size, and within 2-ft. of the exterior face of the wall.

B. Wall pipes shall have a thrust collar located at mid-depth of wall.

C. Encase piping underneath structures in concrete and per Encasement Details included in the Drawings, but never less than a minimum of 6-in. around the pipe. Backfill the remaining trench above the encased pipe with Slurry Backfill or encasement concrete.

3.04 TESTING

A. Clean and test all piping in accordance with Section 01666, Testing of Pipelines. Submit a testing plan including detailed procedures, methods and equipment that will be used for pipeline testing at least 10 days before starting the testing for Engineer’s review and approval. Furnish all necessary equipment and labor for carrying out the specified tests and conduct all tests in the presence of the Engineer.

B. The Owner will provide water for the testing of pipelines. Coordinate connection with the Owner and provide an air gap or backflow preventer. See also Section 01666, Testing of Pipelines.

C. Install and make all valves operational before testing. Provide suitable restrained bulkheads with a sufficient number of outlets for filling and draining the line for venting air.

D. Furnish all necessary gauges, meters, pressure pumps and other equipment and test the lines in the presence of the Engineer or Engineer’s representative.

E. The leakage test may be conducted in conjunction with the pressure test but shall not be less than two (2) hours in duration. Repair and eliminate all leaks evident at the surface regardless of the total leakage as shown by the test. Repair and retest all lines that fail to meet tests as many times as necessary to achieve compliance with the testing requirements. Remove and replace all defective materials, pipes, valves, and accessories.

3.05 CLEANING

A. At the conclusion of the work, thoroughly clean all of the pipe by flushing with water or other means to remove all dirt, stones, pieces of woods, or other material that may have entered during the construction period. Flush the lowest segment outlet last to assure debris removal.

END OF SECTION

SECTION 02517

POLYVINYL CHLORIDE (PVC) PRESSURE PIPE

PART 1 GENERAL

A. SCOPE OF WORK

B. Furnish all labor, materials, equipment, and incidentals to install and test polyvinyl chloride (PVC) water and force main sewer pipe and fittings, complete as shown on the Drawings and as specified herein.

C. Pipe or piping refers to all pipe, fittings, material, and appurtenances required to construct PVC water and force main sewer pipe complete, in place.

D. Site piping shall include all piping and fittings extending outward, upward, and downward into the ground from the outside face of all buildings and structures. Yard piping shall include all piping in valve vaults, manholes, cleanouts, and similar yard structures.

E. Piping shall be located substantially as shown on the Drawings. The Engineer reserves the right to make modifications in piping locations and alignments to avoid interference between pipes or for other reasons. Pipe fitting notation is for the Contractor's convenience and does not relieve the Contractor from installing and jointing different or additional items when required to achieve a complete piping system.

1.02 MATERIALS COMPLIANCE WITH AIS

A. P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), includes an "American Iron and Steel (AIS)" requirement in section 436 that requires Clean Water State Revolving Loan Fund (CWSRF) and Drinking Water State Revolving Loan Fund (DWSRF) assistance recipients to use iron and steel products that are produced in the United States for projects for the construction, alteration, maintenance, or repair of a public water system or treatment works. This Project meets the definition of such work, and the Environment Protection Agency (EPA) implementation requirements for this AIS requirement are outlined within the DWSRF memorandum titled "Implementation of American Iron and Steel provisions of P.L. 113-76, Consolidated Appropriations Act, 2014" included as part of the RLF Supplemental General Conditions.

B. All parties are required to comply with these requirements and to ensure that all qualifying iron and steel products used in this project must be produced in the United States. See RLF Supplemental General Conditions for additional details.

1.03 RELATED SECTIONS

A. Section 01300 – Submittals

B. Section 01666 – Testing of Pipelines

C. Section 02315 – Excavating, Trenching, and Backfilling

D. Section 02510 – Water Distribution

E. Section 02516 – Ductile Iron Pipe and Fittings

F. Section 02530 – Sanitary Sewers

G. Section 02512 – Valves, Hydrants, and Appurtenances

H. Section 03300 – Cast-in-Place Concrete

1.04 REFERENCE STANDARDS

A. ASTM International (ASTM), latest edition:

1. ASTM D1784 Standard Classification System and Basis for Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds

2. ASTM D2241 Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)

3. ASTM D2321 Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications

4. ASTM D3034 Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings

5. ASTM D3139 Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals

6. ASTM F477 Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe

B. American Water Works Association (AWWA), latest edition:

1. AWWA C110 Ductile-Iron and Gray-Iron Fittings

2. AWWA C111 Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings

3. AWWA C153 Ductile-Iron Compact Fittings

4. AWWA C600 Installation of Ductile Iron Water Mains and Their Appurtenances

5. AWWA C605 Underground Installation of Polyvinyl Chloride (PVC) and Molecularly Oriented Polyvinyl Chloride (PVCO) Pressure Pipe and Fittings

6. AWWA C651 Disinfecting Water Mains

7. AWWA C900 Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 In. Through 60 In. (100 mm Through 1,500 mm)

8. AWWA C905 Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 14 In. Through 48 In. (350 mm Through 1,200 mm) *[AWWA has designated C905 as obsolete]*

9. AWWA M23 PVC Pipe – Design and Installation

C. National Sanitation Foundation (NSF), latest edition:

1. NSF 14 Plastics Piping System Components and Related Materials

2. NSF 61 Drinking Water System Components – Health Effects

1.05 SYSTEM DESCRIPTION

A. The piping materials and equipment specified herein are intended to be of standard types for use in transporting potable water or sanitary sewage.

B. Note information in pipe schedules on the Drawings, if any, and in this Section, especially concerning pressures, minimum thickness, etc. In case of a conflict, information given in the pipe schedule shall govern.

C. Contractor is responsible for compatibility between pipe materials, fittings, and appurtenances.

D. Unless otherwise noted, PVC pipe systems shall be designed for the following condition(s).

1. Class: DR14
2. System: AWWA C900
3. Pressure:

a. Operating: 150 psi
b. Testing: 225 psi

4. Force Mains shall be green, water lines shall be blue, and plant water lines shall be purple.

1.06 SUBMITTALS

A. See Section 01300, Submittals, for submittal procedures.

B. Product Data: Provide data on pipe materials, pipe fittings and accessories. Provide design calculations confirming that piping materials meet the required installation and operational conditions. A submittal requiring design calculations shall be prepared and sealed by a Professional Engineer registered in the State where the project will be constructed.

C. Laying Schedule: Submit a tabulated laying schedule referencing stations and piping elevations as well as all fittings, bends, outlets, restrained joints, tees, special deflection bells, adapters, solid sleeves, and specials. Include the manufacturer's detailed drawings and specifications. Show pipe class, station limits, and transition stations for various pipe classes. Submit the laying schedule to the Engineer for approval before manufacture and shipment.

D. Submit anticipated production and delivery schedule.

E. Manufacturer’s Certificate: Certify that pipe, fittings, gaskets, linings, and exterior coatings meet or exceed the specified requirements of these specifications and the referenced ASTM and AWWA standards.

1.07 QUALITY ASSURANCE

A. Furnish all PVC water and sewer pipe shall be from a single manufacturer.

B. The manufacturer shall Inspect and test all PVC pipe and fittings supplied for this project as required by the standard specifications to which the material is manufactured. The supplier shall be responsible for the provisions of all test requirements specified in ASTM D3034 and NSF Standard No. 14 as applicable.

C. The Owner may elect to hire an independent testing laboratory, at the Owner’s expense, to inspect all pipe and fittings at the plant for compliance with these Specifications. The Contractor shall require the manufacturer's cooperation in these inspections.

D. The Engineer or representative of the Owner may inspect the pipe and fittings after delivery. The pipe shall be subject to rejection at any time because of failure to meet any of the requirements specified herein, even though sample pipes may have been accepted as satisfactory at the place of manufacture. Pipe rejected after delivery shall be marked for identification and shall be removed from the job at once.

1.08 DELIVERY, STORAGE, AND HANDLING

A. All items shall be bundled or packaged in such a manner as to provide adequate protection of the pipe ends during transportation to the site. Exercise care in loading, transporting, and unloading to prevent injury to the pipe. Do not drop or skid pipe joints against each other. Use padded slings, hooks, or pipe tongs to prevent damage to the external surface of the pipe. Any pipe damaged in shipment shall be replaced as directed by the Engineer and at no additional cost to the Owner.

B. Store materials protected from damage and exposure to harmful weather conditions. PVC items deteriorate in sunlight and are slightly brittle, especially at lower temperatures, so care shall be taken in loading, transporting, and unloading items to prevent injury to the items. Examine all items before installation, and do not install any piece that is found to be defective. Handle and install pipe and fittings in accordance with the manufacturer's instructions, the referenced standards, and as specified herein.

C. Any pipe or fitting showing a crack, or which has received a blow that may have caused an incident fracture, even though no such fracture can be seen, shall be marked as rejected and removed at once from the work.

D. Any gouges or scratches that extend 10% or more into the pipe wall shall be cause for rejection of that pipe. The undamaged portion may cut off and used. Rejected materials shall be clearly marked as rejected, segregated, and removed from the site.

E. While stored, pipe shall be adequately supported from below at intervals of not more than 3 feet to prevent deformation. The pipe shall be stored in stacks no higher than that given in the following table:

Pipe Diameter (inches)	Maximum No. of Rows Stacked
8 or less	5
12 to 21	4
24 to 30	3
33 to 48	2
54 and larger	1

F. Pipe and fittings shall be stored in a manner that will keep them at ambient outdoor temperatures and out of the sunlight. The Contractor shall provide temporary shading as required to meet this requirement. Simple covering of the pipe and fittings that allows temperature buildup or direct or indirect sunlight will not be permitted.

G. If any defective item is discovered after it has been installed, it shall be removed and replaced at the Contractor's own expense. All pipe and fittings shall be thoroughly cleaned before installation and the interior shall be kept clean until testing.

H. In handling the items, use special devices and methods as required to achieve the results specified herein. Pipe handling equipment and devises shall be as recommended by the pipe manufacturer.

1.09 COORDINATION

A. Coordinate the work of this Section with the work of other sections. Verify at the site both the dimensions and work of other trades adjoining items of work in this Section before commencement of items herein specified.

B. Furnish to the pertinent trades all items included under this Section that are to be built into the work of other sections.

C. Do not disrupt service to utility customers during installation of the piping improvements except for the time required to make connections to a new main.

D. Notify the Public Utility Department and Engineer at least 48 hours prior to scheduled connections of mains.

1.10 FIELD MEASUREMENTS

A. Take field measurements at the site to verify or supplement indicated dimensions and to ensure proper coordination of all other construction items.

PART 2 PRODUCTS

2.01 POLYVINYL CHLORIDE (PVC) PIPE AND FITTINGS

A. PVC pipe and fittings shall have bell and spigot push-on joints. The bell shall consist of an integral wall section with a solid cross-section elastomeric gasket securely locked in place to prevent displacement during assembly. Installation of elastomeric gasketed joints and performance of the joint shall conform to ASTM F477 and ASTM D3139. Joint lubricants for potable water piping shall be as recommended by the manufacturer and meet all requirements of NSF 61.

B. All water lines are to bear the NFS-61 seal of approval for potable water.

C. PVC Water pipe in sizes 4" – 12" shall meet the requirements of AWWA C-900 DR-14 and comply with ASTM D1784 pressure classification rated class 305. Pipe joints shall be integrally molded bell ends in accordance with ASTM 3034 with factory supplied elastomeric gaskets and lubricant. Pipe to bear NFS-61 seal of approval for potable water. The pipe shall be approved by the Underwriter's Laboratories (UL) for use in underground fire protection service. The pipe shall be extruded from PVC meeting the requirements of cell classification 12454-B as defined in ASTM-D-1784, PVC compounds. The pipe shall be manufactured to cast iron size (C.I.) outside dimensions. All Pipe Identification markings shall remain legible during normal handling, storage, and installation. Markings on pipe shall include the following and shall be applied at intervals of not more than 5':

1. Nominal size and OD (DR-14)
2. PVC
3. Dimension ration (DR-14)
4. AWWA pressure class (for example PVC1120 or PC200)
5. AWWA designation numbers (AWWA C-900)
6. Manufacturer's name or trademark and production code
7. Seal (mark) of the testing agency that verified the suitability of the pipe.
8. Material for potable water service. (for example, NSF-61 or ULFM)

D. All fittings and accessories for waterlines and sewers shall have bell and/or spigot configurations compatible with the pipe.

E. All fittings for water mains shall be ductile iron conforming to AWWA C110 or C153 for mechanical joints. All adaptors, fittings, and transition gaskets necessary to connect ductile iron fittings to PVC shall be furnished.

F. Force mains shall be green in color. Water lines shall be blue in color. Plant Water lines shall be purple.

G. Where restrained joints are shown on the Drawings restraining glands shall be installed. Restraining glands for PVC pipe shall conform to AWWA C111 and be Megalug by EBAA Iron Sales, Inc. or approved equal.

2.02 TRACER WIRE

A. All pipe, both buried and encased, shall be installed with tracer wire. Tracer wire shall be single 10-gauge type TW (single strand) insulated copper tracer wire and shall be terminated in tracer wire boxes at the locations shown on the Drawings. Tracer wire shall be located on top of pipe and buried with pipe. All tracer wire shall be installed in conjunction with the pipe at the same depth as the pipe. Tracer wire junction boxes shall be installed at intervals shown on the Drawings, but not exceeding 1,000 feet unless specifically authorized by the Engineer.

B. Tracer wire shall not be connected in any way to main or any other underground metal (except other tracer wires). Installation of locator wire shall be tested 1 time before the 1st acceptance inspection. Tracer wire shall be tested after curbs are installed and prior to asphalt.

C. Wire shall be accessible at all valve boxes and meter boxes and shall extend a minimum of 6” above the valve or meter box, at the main or service. Connect all locator wires together so that a continuous electrical path is ensured. Tracer wire shall be installed through the outside of the valve box bottom section then inserted through the inside of the top section of the valve box. A minimum of 6” to maximum of 12” of tracer wire is required to be extended beyond the top of the valve box.

D. To connect locator wires, the wires shall be spliced using a split bolt connector (Blackburn 9H or Kearney KS90) or equal, then covered with electrical plastic tape (Type 3M Scotch 33) so that a waterproof joint is made.

E. Tracer Wire valve boxes shall be Tyler 6850 series or equal with 5 ¼" shafts, screw type, and 5 ¼" drop lid with “WATER” or “SEWER” on cast iron lid. All valve box material shall be domestically made. The tracer wire valve box extension shall be C900 Class 235 (DR 18) PVC.

F. Tracer Wire boxes shall be located no further than 500 feet and placed at every angle change in direction along force mains.

PART 3 EXECUTION

3.01 INSTALLATION OF PVC PIPE AND FITTINGS

A. No single piece of pipe shall be laid unless it is straight. The centerline of the pipe shall not deviate from a straight line drawn between the centers of the openings at the ends of the pipe by more than 1/16-inch per foot of length. If a piece of pipe fails to meet this requirement, check for straightness, it shall be rejected and removed from the site. Laying instructions of the manufacturer shall be explicitly followed.

B. Defective pipe discovered after installation shall be removed and replaced with a sound pipe in a satisfactory manner at no additional cost to the Owner. Thoroughly clean all pipe and fittings before installation and keep installed piping clean until accepted by the Owner. Install PVC pipe and fittings in accordance with the requirements of the manufacturer, ASTM D2321, AWWA C605, or as otherwise provided herein.

C. Excavate the trench to subgrade and place granular bedding, compacted and graded to provide firm, uniform and continuous support for the pipe. Excavate bell holes so that only the barrel of the pipe bears upon the bedding. Lay the pipe to the lines and grades indicated on the Drawings. Blocking under the pipe will not be permitted. Place granular bedding evenly on each side of the pipe to mid-diameter. Use hand tools to force the bedding under the haunches of the pipe and into the bell holes to give firm continuous support for the pipe. Place granular bedding to 6 inches above the top of the pipe. The initial 3 feet of backfill above the bedding shall be placed in 12-inch layers and carefully compacted. Generally, conduct compaction efforts evenly on each side of the pipe, and do not operate compaction equipment directly over the pipe until sufficient backfill has been placed to prevent damage to ensure that such compaction equipment will not have a damaging effect on the pipe. Equipment used in compacting the initial 3 feet of backfill shall be approved by the pipe manufacturer's representative prior to use.

D. All piping shall be sound and clean before installation. When installation is not in progress, including breaks and lunchtime, close the open ends of the pipe with a watertight plug or other approved means. Good alignment shall be preserved during installation. The deflection at pipe joints shall not exceed that recommended by manufacturer. Fittings for alignment changes at existing utilities encountered during construction shall only be used with the permission of the Engineer.

E. Cut all pipe with a manufacturer-approved cutting machine, leaving a smooth cut at right angles to the axis of the pipe. Bevel the cut ends of pipe to be used with a bell to conform to the manufactured spigot end and make a reference mark at the same distance from the pipe end as measured from a factory marked end from the same manufacturer.

F. The Engineer may examine each bell and spigot end to determine whether any preformed joint has been damaged prior to installation. Any pipe having defective joint surfaces shall be rejected, marked as such and immediately removed from the job site.

G. Each length of the pipe shall have the assembly mark aligned with the pipe previously laid and held securely until enough backfill has been placed to hold the pipe in place.

H. Before installing a new pipe joint, check the pipe to ensure that a closed joint with the next adjoining pipe has been maintained, and that the inverts are matched and conform to the required grade. Do not drive the pipe down to grade by striking it.

I. Take all precautions to prevent flotation of the pipe in the trench.

J. When using moveable trench bracing such as trench boxes, moveable sheeting, shoring or plates to support the sides of the trench, care shall be taken in placing and moving the boxes or supporting bracing to prevent movement of the pipe, or disturbance of the pipe bedding and the backfill. If trench boxes, moveable sheeting, shoring or plates have been installed below the top of pipe, they shall be moved slowly taking care not to disturb pipe, bedding or backfill. As trench boxes, moveable sheeting, shoring or plates are moved, place additional pipe bedding to fill any voids created, and recompact the backfill to provide uniform side support for the pipe.

K. Install concrete thrust blocks in accordance with the requirements of Section 02510 Water Distribution.

L. Install restrained joints where shown on the Drawings or as directed by the Engineer.

3.02 JOINTING PVC PIPE AND FITTINGS (Push-on type)

A. Install pipe joints in strict accordance with the manufacturer's instructions. Lay pipe with bell ends looking ahead. Insert a rubber gasket in the groove of the bell end of the pipe, and clean and lubricate all joint surfaces. Insert the plain end of the pipe in alignment with the bell of the pipe to which it is to be joined and push it home with a come-along or by other means. Check that the reference mark on the spigot end is flush with the end of the bell.

3.03 JOINTING MECHANICAL JOINT FITTINGS

A. Install mechanical joints at valves, fittings and as designated on the Drawings in accordance with the AWWA C111 and the instructions of the manufacturer. Install suitable PVC-to-cast iron adaptors prior to installing fittings. Cut PVC beveled spigot flush prior to insertion in mechanical joint pipe. To assemble the joints in the field, thoroughly clean the joint surfaces and rubber gasket with soapy water before tightening the bolts. Tighten bolts to the specified torques. Under no condition shall the Contractor use extension wrenches or pipe over the handles of ordinary ratchet wrenches to secure greater leverage.

3.04 CLEANING

A. At the conclusion of the work, thoroughly clean all piping by flushing with water or other means to remove all dirt, stones, pieces of woods, or other material that may have entered during the construction period. Flush the lowest segment outlet last to assure debris removal.

3.05 TESTING

A. Clean and test all piping in accordance with Section 01666, Testing of Pipelines. Submit a testing plan including detailed procedures, methods and equipment that will be used for pipeline testing at least 10 days before starting the testing for Engineer's review and approval. Furnish all necessary equipment and labor for carrying out the specified tests and conduct all tests in the presence of the Engineer.

B. The Owner will provide water for the testing of pipelines. Coordinate connection with the Owner and provide an air gap or backflow preventer. See also Section 01666, Testing of Pipelines.

C. Install and make all valves operational before testing. Provide suitable restrained bulkheads with a sufficient number of outlets for filling and draining the line and for venting air.

D. Furnish all necessary gauges, meters, pressure pumps and other equipment and test the lines in the presence of the Engineer or Engineer’s representative.

E. The leakage test may be conducted in conjunction with the pressure test but shall not be less than two (2) hours in duration. Repair and eliminate all leaks evident at the surface regardless of the total leakage as shown by the test. Repair and retest all lines that fail to meet tests as many times as necessary to achieve compliance with the testing requirements. Remove and replace all defective materials, pipes, valves, and accessories.

END OF SECTION

SECTION 02530

SANITARY SEWERS

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals; and install and test sanitary sewer lines as shown on the Drawings and as specified herein.

B. Process sanitary sewer lines shall be constructed using ductile iron pipe. Ductile iron pipe shall include a an epoxy lining and polyethylene exterior wrap. Small-diameter gravity sanitary sewer drain lines shall be constructed of PVC pipe. Small-diameter sanitary sewer pressurized force mains shall be constructed of PVC or HDPE.

C. Sanitary sewer manholes shall be cast-in-place structures.

1.02 MATERIALS COMPLIANCE WITH AIS

A. P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), includes an “American Iron and Steel (AIS)” requirement in section 436 that requires Clean Water State Revolving Loan Fund (CWSRF) and Drinking Water State Revolving Loan Fund (DWSRF) assistance recipients to use iron and steel products that are produced in the United States for projects for the construction, alteration, maintenance, or repair of a public water system or treatment works. This Project meets the definition of such work, and the Environment Protection Agency (EPA) implementation requirements for this AIS requirement are outlined within the DWSRF memorandum titled “Implementation of American Iron and Steel provisions of P.L. 113-76, Consolidated Appropriations Act, 2014” included as part of the RLF Supplemental General Conditions.

B. All parties are required to comply with these requirements and to ensure that all qualifying iron and steel products used in this project must be produced in the United States. See RLF Supplemental General Conditions for additional details.

1.03 RELATED SECTIONS

A. Section 01666 – Testing of Pipelines

B. Section 02315 – Excavation, Trenching and Backfilling

C. Section 02516 – Ductile Iron Pipe and Fittings

D. Section 02531 – Sanitary Sewer Manholes, Frames and Covers

E. Section 02535 – Polyvinyl Chloride (PVC) Non-Pressure Sewer Pipe

F. Section 02920 – Seeding

1.04 REFERENCE STANDARDS

A. ASTM International (ASTM), latest edition:

1. ASTM C478 Standard Specification for Precast Reinforced Concrete Manhole Sections
2. ASTM C1244 Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test
3. ASTM D1784 Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds
4. ASTM D1785 Standard Specification for Poly (Vinyl Chloride)(PVC) Plastic Pipe, Schedules 40, 80, and 120
5. ASTM D2241 Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series)
6. ASTM D2729 Standard Specification for Poly (Vinyl Chloride)(PVC) Sewer Pipe and Fittings
7. ASTM D3034 Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings
8. ASTM F679 Standard Specification for Poly (Vinyl Chloride) (PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings
9. ASTM F949 Standard Specification for Poly (Vinyl Chloride) (PVC) Corrugated Sewer Pipe With a Smooth Interior and Fittings

B. American Water Works Association (AWWA), latest edition:

1. AWWA C104 Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water
2. AWWA C110 Gray-Iron Fittings, 3-inch through 48-inches (7 mm through 1200 mm) for Water and Other Liquids
3. AWWA C111 Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
4. AWWA C150 Thickness Design of Ductile-Iron Pipe
5. AWWA C151 Ductile-Iron Pipe, Centrifugally Cast, For Water or Other Liquids
6. AWWA C600 Installation of Ductile-Iron Water Mains and Their Appurtenances

1.05 SUBMITTALS

A. See Section 01300, Submittals for submittal procedures.

B. Product Data: Provide data on pipe materials and accessories.

C. Submit anticipated production and delivery schedule.

D. Manufacturer's Certificate: Certify that pipe and appurtenances meet or exceed the specified requirements of the referenced ASTM and AWWA Standards.

1.06 COORDINATION

A. Coordinate the work of this Section with the work of other sections. Verify at the site both the dimensions and work of other trades adjoining items of work in this Section before commencement of items herein specified.

B. Furnish to the pertinent trades all items included under this Section that are to be built into the work of other sections.

C. Do not disrupt service to utility customers during installation of the piping improvements except for the time required to make connections to a new main.

D. Notify the Public Utility Department and Engineer at least 48 hours prior to scheduled connections of mains.

E. Work may proceed on one or more lines simultaneously; however, once work has commenced on any given line, continue that construction until its completion.

F. Vary the sequence of construction as directed by the Engineer.

1.07 QUALITY CONTROL

A. Provide all layout staking including establishing temporary benchmarks, alignment staking, and offset hubs. Submit a copy of the proposed sewer trench cut sheet to the Engineer for review purposes prior to commencement of work on any sewer segment.

B. Provide equipment and labor necessary to verify proper vertical and horizontal alignment of all manholes and sewer pipe alignment 60-ft. from each manhole. Submit written documentation of correct alignment, grades and elevations to the Engineer before proceeding with the sewer segment.

C. Engineer may require additional checks of alignment, elevation and grades as necessary to verify the accuracy of the installation. Failure to achieve the vertical and horizontal alignment as specified on the Drawings shall be cause for rejection of the work, correction of which shall be at the Contractor’s expense.

D. Submit all testing documentation to the Engineer in accordance with the field testing requirements of this Section.

1.08 FIELD MEASUREMENTS

A. Field measurements shall be taken at the site to verify or supplement indicated dimensions and to ensure proper coordination of all other construction items.

PART 2 PRODUCTS

2.01 GENERAL

A. All materials shall conform to the standards referenced. All gasket and joint materials, lubricants, adhesives and other incidental materials shall conform to the pipe manufacturer's recommendations.

B. All fittings for sewer pipe shall be made of the same material as the sewer main whether it is Ductile Iron or Heavy Wall SDR-26. Fittings shall have a push-on gasket seal that will allow for a passing air test. All fittings shall be submitted to the Bentonville Water Utilities Department for approval prior to installation.

2.02 SEWER PIPE

A. Unless otherwise indicated on the Drawings, sanitary sewers shall be constructed of any one of the following piping materials:

1. Ductile iron pipe, conforming to Section 02516 – Ductile Iron Pipe and Fittings.

2.03 MANHOLES

A. Unless otherwise indicated on the Drawings, sanitary sewers shall be constructed by any one of the following methods:

1. Cast-in-place manholes, conforming to Section 02531 – Sanitary Sewer Manholes, Frames and Covers.

B. See Section 02531, Sanitary Sewer Manholes, Frames and Covers for the requirements for frame and cover castings, waterstop, piping connections, and other appurtenances.

PART 3 EXECUTION

3.01 GENERAL

A. Exercise care in loading, transporting and unloading to prevent injury to pipe or precast manhole structures.

B. Examine all pipe, appurtenances, and precast structures for soundness before installation, and do not install defective pieces. Repair damaged pipe coatings per manufacturer’s recommendations.

3.02 INSTALLATION

A. The construction of all sewers shall begin at the outlet or the low point of the line. When the construction involves the installation of lateral branches, the construction of the laterals shall not be started until the main sewer has been completed to the point where the lateral discharges into it. All pipe shall be laid to the line and grade as required by the plans and specifications and as directed by the Engineer. The Contractor shall be responsible for maintaining the specified elevations, lines, and grades. All sewer pipe

installed at incorrect elevations, lines and grades shall be removed and relaid by the Contractor at his expense.

B. The Contractor shall furnish and operate laser equipment or other devices required for aligning and grading pipe.

C. Except by special permission, no pipe shall be laid except in the presence of an inspector. No pipe shall be laid unless the trench subgrade is in a condition satisfactory to the Engineer and has been approved by the Engineer. Pipe shall not be laid on frozen ground or when the condition of the trench or the weather is unsuitable for such work. Pipe shall be kept clean at all times.

D. Laying, cutting, and jointing of pipe shall be accomplished in accordance with the pipe manufacturer's instructions. Copies of the manufacturer's instructions shall be furnished the Engineer when requested.

E. Trenching, bedding, backfilling, and related work shall be as specified in other sections of these specifications.

F. Each length of pipe shall be inspected before and after being laid. Any pipe found to be cracked, damaged or otherwise defective shall be plainly marked in such a manner that the markings will not rub or wash off, and the pipe shall subsequently be removed from the site.

G. Bell and spigot pipe shall be laid with the bell end upstream unless otherwise directed by the Engineer.

H. Pipe shall be protected during handling against impact shocks and free fall. The Contractor shall furnish and use the necessary facilities for lowering the pipe into the trench in a manner that will not damage or disturb either the pipe or the trench.

I. Pipe shall be laid with uniform bearing under the full length of the pipe barrel. Excavation shall be made to receive the bell or collar, which shall not bear upon the subgrade or bedding.

J. Prior to making the joints, all joint surfaces shall be clean and dry. Lubricants, primers, adhesives and other jointing agents shall be used as recommended by the pipe or joint manufacturer's specifications. The jointing material or factory-fabricated joints shall then be fitted, joined and adjusted to obtain an acceptable joint.

K. A minimum vertical separation between water lines and sanitary sewer lines of 18 inches shall be maintained, with the water line crossing over the sanitary sewer line. Horizontal separation of water and sewer lines shall not be less than ten feet.

L. At the close of work each day, or whenever the work ceases for any reason, the end of the pipe shall be temporarily closed or plugged to prevent the entrance of water, mud or foreign material.

M. Connections to structures and related work shall be as specified in other sections of these specifications.

3.03 SERVICE LINES

A. Service lines including wyes, risers and other fittings shall be installed at the locations and in accordance with the details shown on the plans unless otherwise directed by the Engineer.

B. Service branches in new mains shall be standard wye or tee fittings and shall be of the same material used in the main. Sewer service lines and stubs shall be of cast iron or Schedule 40 PVCP. Taps into existing mains shall utilize a gasketed or solvent cement saddle or shall consist of a standard fitting inserted into the main using repair sleeve couplings.

C. Service lines shall be installed on a uniform slope at a minimum grade of 1/4 inch per foot for 4-inch pipe and 1/8 inch per foot for 6-inch pipe unless otherwise directed by the Engineer. Where the depth of the sewer main is greater than eight feet, a riser shall be installed.

D. Connection of service lines to existing lines shall be made using standard couplings, adapters and repair couplings as required. Service stubs (for future extension of service lines) shall be capped or plugged.

E. Service lines shall not be backfilled or covered until they have been inspected, approved, and located by the Engineer. After approval and before backfilling, nylon or polyethylene rope of a minimum size of 1/4" diameter shall be tied to service stubs and extended vertically while backfilling. At the completion of backfilling, the rope shall be tied to anchor stake.

3.04 FIELD TESTS

A. GENERAL

1. Testing of all sanitary sewer line improvements shall be in accordance with Section 01666, Testing of Pipelines.

B. TESTING OF NEW MANHOLES

1. Testing of all manholes shall be in accordance with Section 02531, Sanitary Sewer Manholes, Frames and Covers.

2. No gravity sewer or manhole will be accepted that does not comply with the minimum requirements of tests described within these specifications.

END OF SECTION

SECTION 02531

SANITARY SEWER MANHOLES, FRAMES AND COVERS

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment, and incidentals required to install and test sanitary sewer manholes as shown on the Drawings and as specified herein.

B. The work shall include monolithically cast-in-place concrete manholes with transitions to lid frames, covers, and accessories.

1.02 MATERIALS COMPLIANCE WITH AIS

A. P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), includes an “American Iron and Steel (AIS)” requirement in section 436 that requires Clean Water State Revolving Loan Fund (CWSRF) and Drinking Water State Revolving Loan Fund (DWSRF) assistance recipients to use iron and steel products that are produced in the United States for projects for the construction, alteration, maintenance, or repair of a public water system or treatment works. This Project meets the definition of such work, and the Environment Protection Agency (EPA) implementation requirements for this AIS requirement are outlined within the DWSRF memorandum titled “Implementation of American Iron and Steel provisions of P.L. 113-76, Consolidated Appropriations Act, 2014” included as part of the RLF Supplemental General Conditions.

B. All parties are required to comply with these requirements and to ensure that all qualifying iron and steel products used in this project must be produced in the United States. See RLF Supplemental General Conditions for additional details.

1.03 RELATED SECTIONS

A. Section 01666 – Testing of Pipelines

B. Section 02315 – Excavation, Trenching and Backfilling

C. Section 02530 – Sanitary Sewers

D. Section 02920 – Seeding

E. Section 03300 – Cast-In-Place Concrete

F. Section 03600 – Grout

1.04 REFERENCE STANDARDS

A. ASTM International (ASTM), latest edition:

1. ASTM A48 Standard Specification for Gray Iron Castings
2. ASTM A536 Standard Specification for Ductile Iron Castings
3. ASTM C33 Standard Specification for Concrete Aggregates
4. ASTM C150 Standard Specification for Portland Cement
5. ASTM C443 Standard Specifications for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets
6. ASTM C923 Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals
7. ASTM C1244 Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test
8. ASTM D4101 Standard Specification for Propylene Plastic Injection and Extrusion Materials

B. American Concrete Institute (ACI), latest edition:

1. ACI 318 Building Code Requirements for Structural Concrete
2. ACI 350 Code Requirements for Environmental Engineering Concrete Structures

1.05 SUBMITTALS

A. See Section 01300, Submittals for submittal procedures.

B. Product Data: Provide product data for the following:

1. Manhole frames and covers with certification indicating conformance with the referenced ASTM standard and class or duty designation.
2. Pipe connections to cast-in-place structures or elements.

C. Design Data: Provide certified design data for the following cast-in-place elements:

1. Sectional plans and elevations showing dimensions and reinforcing steel placement.
2. Structural calculations including assumptions.
3. Concrete mix design.

D. Test Reports: Provide certified test results for the following:

1. Concrete test cylinder reports from an approved testing laboratory certifying conformance with the specifications.

2. Results of field leakage tests.

E. Manufacturer's Installation Instructions.

1.06 QUALITY ASSURANCE

A. Furnish all new materials and appurtenances.

B. Furnish product certification indicating compliance with the referenced ASTM standards and these specifications.

C. The Engineer will examine materials for compliance with ASTM standards, this Section, and approved manufacturer's drawings. Additional inspection criteria shall include appearance; dimensions; the presence of blisters, cracks, or honeycombs; and the general soundness of the structure.

D. Completed manholes shall be subject to rejection at any time because of failure to meet any of the referenced standards or specification requirements. The Engineer shall mark the rejected manhole or appurtenance, and the Contractor shall demolish and/or remove the item from the project. Rejected items shall be replaced at no additional cost to the Owner.

1.07 COORDINATION

A. Coordinate the work of this Section with the work of other sections. Verify at the site both the dimensions and work of other trades adjoining items of work in this Section before commencement of items herein specified.

B. Furnish to the pertinent trades all items included under this Section that are to be built into the work of other sections.

1.08 FIELD MEASUREMENTS

A. Take field measurements at the site to verify or supplement indicated dimensions and to ensure proper coordination of all other construction items.

PART 2 PRODUCTS

2.01 GENERAL

A. Reference to a manufacturer's name and model or catalog number is for the purpose of establishing the standard of quality and general configuration desired.

B. Like items of materials, equipment or appurtenances shall be the products of one (1) manufacturer in order to provide standardization for appearance, operation, maintenance, spare parts and manufacturer's service.

C. Cement shall conform to ASTM C150, Type II cement or equal.

2.02 CONCRETE FOR MANHOLES

A. Unless otherwise noted on the Drawings, cast-in-place concrete for manholes shall have a minimum 28-day compressive strength of 4,000 psi.

2.03 MORTAR

A. Mortar shall consist of one (1) part Type II Portland cement and two (2) parts clean sand with only enough water for workability.

2.04 FLEXIBLE GASKETS FOR WALL PENETRATIONS

A. Elastomeric Waterstop Gaskets: Waterstop gaskets for pipe entrances into cast-in-place concrete manholes shall be made of elastomeric PVC and shall be Fernco Concrete Manhole Adaptors (CMA's) for pipe diameters 12 inches and smaller, Fernco Large-Diameter Waterstops for pipe diameters larger than 12 inches, or approved equal.

2.05 CONCRETE ADJUSTMENT COLLARS

A. Concrete adjusting collars, used for setting the cast iron frame and covers to the required elevation, shall be made of concrete, shall have a minimum wall thickness of 6 inches, and shall have an inside diameter the same as the existing inside diameter of the top of the manhole.

2.06 MANHOLE FRAMES AND COVERS

A. Standard Frame and Cover: Circular manhole ring and cover, cast iron, with a heavy duty load rating. Manhole covers shall be 23-1/2 inches in diameter (minimum); have a frame height of 6 inches; and include a notch or tool entrance to permit removal of the cover, but no other "pick holes", vents or other such opening for the entrance of surface water drainage. Frame and cover shall have machined bearing surfaces to prevent rocking of the cover. Castings shall be free from cracks, holes and swells, and shall and conform to ASTM A48, Class 30 minimum.

1. Manhole frames and covers shall be East Jordon Iron Works Catalog No. 00134865A01, or approved equal. Covers shall include "Sanitary Sewer" or "City of Bentonville Sanitary Sewer" lettering cast on the lid.

B. Bolt-down Frame and Cover: Circular manhole ring and cover, cast iron, with a heavy duty load rating. Manhole covers shall be 23-1/2 inches in diameter (minimum); have a frame height of 4-1/2 inches (minimum); include gasketed and threaded frame holes to receive a minimum of four (4) machined stainless steel bolts to hold the cover in place; and include a notch or tool entrance to permit removal of the cover. Cover shall include no other "pick holes", vents or other such opening for the entrance of surface water

drainage. Castings shall be free from cracks, holes and swells, and shall conform to ASTM A48, Class 30 minimum.

1. Bolt-down manhole frames and covers shall be East Jordon Iron Works, Product 00124855W02, or approved equal. Covers shall include "Sanitary Sewer" or “City of Bentonville Sanitary Sewer” lettering cast on the lid.

2.07 FLEXIBLE GASKETS FOR MANHOLE FRAMES (NOT USED)

2.08 MANHOLE ADJUSTMENT RINGS

A. Manhole adjusting rings shall be cast iron conforming to ASTM A48 or ductile iron conforming to ASTM A536. Adjusting rings shall be similar and equal to the R-1979 series manufactured by Neenah Foundry. The Contractor shall determine all dimensions and shall insure correct sizing of the adjusting rings.

2.09 MANHOLE GROUT LINER MATERIAL

A. Manhole Grout Liner Material for coating the inside walls of existing concrete or brick manholes shall be a fiber-reinforced, spray-applied, calcium aluminate based cemetitious mortar and shall be factory blended requiring only the addition of water at the jobsite. The grout line material shall be Strong-Seal MS-2A, MS-2C, or High-Performance Mix as specified on the Drawings and as manufactured by Strong Company, or approved equal.

2.10 MANHOLE PATCHING MATERIAL

A. Manhole Patching Material for filling voids and repairing walls and inverts of concrete, brick, or other masonry structures shall be a rapid-setting (10-15 minutes), fiber-reinforced, high-early strength, corrosion-resistant, hand mixed, hand-applied, calcium aluminate-based cemetitious material conforming to Strong-Seal QSR as manufactured by Strong Company, or approved equal. The patching material shall have a minimum compressive strength of 1,400 psi at 6 hours and shall be factory blended requiring only the addition of water at the jobsite.

2.11 MANHOLE LEAK-STOP MATERIAL

A. Manhole Leak-Stop Material shall be used where the infiltration flow rate through the manhole wall or pipe connection is greater than can be controlled with manhole patching material. Manhole Leak-Stop Material shall be specifically formulated for leak control, rapid-setting (60 seconds), fiber-reinforced, high-early strength, corrosion-resistant, hand-mixed, hand-applied, calcium aluminate-based cementitious material conforming to Strong-Plug as manufactured by Strong Company, or approved equal. The leak stop material shall have a minimum compressive strength of 1,000 psi at 24 hours and shall be factory blended requiring only the addition of water at the jobsite.

2.12 ANCILLARY ITEMS

A. Do not include steps, rungs or ladders unless specifically indicated on the Drawings.

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS FOR MANHOLES

A. Construct manholes to the dimensions shown on the City of Bentonville Water Utilities Department Detail SS01. Unless otherwise noted in Part 1 above, manholes shall be constructed of cast-in-place

B. Manholes constructed of fiberglass or other materials will not be allowed.

C. Finished manhole shall have an inside diameter of 48 inches (minimum) from the base to the sloping cone section at the top of the manhole for sewer mains 12 inches and less, shall have an inside diameter of 60 inches for sewer mains 12 inches to 24 inches, and shall have an inside diameter of 72 inches for pipes greater than 24 inches. The inside diameter of the opening at the top of the cone section shall not be less than 26 inches. Unless otherwise noted on the Drawings, the sloping cone section shall be concentric and have a height of not less than 24 inches and not more than 30 inches.

D. Manholes installed on existing sewer lines shall be constructed in a manner that will not disturb the alignment and grade of the existing pipe except for required alterations. Existing pipes within the manhole shall be removed as required to permit construction of the manhole invert. When authorized by the Engineer, the manhole may be constructed with the sewer pipe in place and the upper half of the pipe removed after the invert has been constructed.

E. Do not include steps, rungs, or ladders.

F. Protect all work against flooding and flotation.

3.02 MANHOLE BASES

A. The bottom of the concrete manhole base shall be level, and the minimum thickness of the concrete base below the invert of the channel shall be 12 inches.

B. Regardless of the type of manhole construction, construct channels at the bottom of each manhole. The invert channels shall be smooth, shall be accurately shaped to a semi-circular bottom conforming to the inside shape of the adjacent sewer section, shall have a uniform slope from the inlet to the outlet pipe, shall extend up to at least half of the diameter of the pipe, and shall have smooth curves with radii as large as the size of the manhole will permit. Unless indicated on the Drawings, maintain a minimum 0.1 foot drop from the inlet invert to the outlet invert of each manhole.

C. All manholes shall contain a concrete shelf on each side of the invert channel. The top of the shelf at the edge of the channel shall be a minimum of 1/2 (50%) of the largest diameter of the connecting pipe above the invert of the channel. The shelf shall rise a minimum of 1-inch per foot from the edge of the channel to the wall of the manhole. Dips or projections capable of holding water or solid materials will not be permitted.

D. CAST-IN-PLACE MANHOLES

1. The concrete foundation for cast-in-place manholes shall be placed as soon as practicable after the sewer pipe has been installed through the manhole location. The concrete for the base of the manhole shall be placed on a 6-inch-thick gravel bed (minimum). Form invert channels in the concrete base during or immediately after the placing of the manhole base and provide a brush finish as soon as the concrete has sufficiently set. Where required to correct deficiencies in the constructed concrete invert, invert channels shall be shaped and smoothed with manhole patching material. Concrete shall be deposited evenly distributed in a continuous pour in maximum layers of 18 inches, with each layer vibrated to bond it to the preceding layer.

2. The concrete base shall be a minimum thickness of 8 inches below the invert and shall be poured on undisturbed earth. The base shall extend a minimum of 24 inches in all directions from the exterior of the manhole barrel.

3.03 MANHOLE WALLS

A. CAST-IN-PLACE MANHOLES

1. Set manhole form sections plumb and level, trim to correct elevations, and anchor to the base pad. Cast-in-place manholes shall have minimum wall thickness as shown below.

Manhole Depth	Minimum Thickness of Wall
up to 12 feet	6 inches
over 12 feet	8 inches

The wall shall be poured monolithically with the base, or the base shall be provided with a construction joint or waterstop. The forms used for construction of the barrel shall be of such fabrication and set so that the walls of the manhole constructed are to the minimum thickness noted above and shall be smooth with no form marks on the interior or exterior wall exceeding 1/4 inch.

2. The concrete shall be placed uniformly around the manhole in 18 inches maximum lifts. Each lift shall be thoroughly vibrated prior to placement of succeeding lifts. All concrete shall be free of honeycomb or other defects. The Contractor shall correct all defective areas as directed by the Engineer.

3.04 MANHOLE FRAMES AND COVERS

A. Install cast iron frame and covers on the top of all manholes. Center the cast iron frames over the manhole cone section, carefully leveled and placed to the elevations shown on the Drawings or to an elevation as directed by the Engineer. Install concrete adjusting collars and mortar as required to set the top of the frame at the correct elevation and slope. Unless otherwise directed by the Engineer, the top of the frame and cover shall conform to the following requirements:

1. Within or adjacent to paved street or driving surfaces: Set the top a minimum of 4 inches above the proposed final grade.

2. Offsite or non-street side: Set the top 12 inches above proposed final grade.

3. Near drainage channels or ditches: Set the top a minimum of 12 inches above the adjacent ground or as indicated on the Drawings.

4. Within asphalt paved areas: Set manhole frame and cover to final grade prior to construction of permanent pavement. Construct a 6-foot square, 6-inch minimum thick concrete cap around the manhole frame and cover unless otherwise indicated on the Drawings.

B. Cone Top Section: Attach the cast iron frame and concrete adjusting collars to the top of the manhole cone section using a flexible plastic or butyl rubber gasket. Construct a concrete grout cap around the cast iron frame and any concrete adjusting rings. Grout the manhole wall as necessary to form a continuous smooth and uniform surface from 3 inches below the top of the cone to 1 inch above the bottom of the cast iron frame. After the grout has cured, wrap exterior joint sealing material, having a minimum width of 12 inches, around the outside of the manhole and centered over the joints between the cast iron frame, concrete adjusting rings, and manhole wall. The installation of the joint sealing material shall conform to the manufacturer's written recommendations.

C. Flat slab top section: Set flat slab top section (with integral frame and cover) level and without tipping, to correct elevations. Utilize precast concrete grade rings, a maximum of 8-inches thick, to assure the frame and cover are set to finished grade.

D. Backfill carefully and evenly around manholes.

3.05 AIR/VACUUM COMBINATION VALVE MANHOLES

A. Manholes for air/vacuum combination valves shall be 5 feet inside diameter cast-in-place manholes with a 30 inch composite lid, and shall be lined with an approved product to prevent degradation of the manhole. The manhole shall be centered over the valve and constructed by pouring the walls centered on top of an 18 inch wide by 12 inch deep footing of compacted class 7 base. #67 stone bedding shall be provided from a minimum of 12 inches below the force main up to the top of the pipe. All other aspects of the manhole not specifically listed in this section shall meet all requirements found elsewhere in these specifications including, but not limited to materials, construction requirements, and City of Bentonville Water Utilities Standard Detail LS08.

3.06 PIPING CONNECTIONS TO MANHOLES

A. New Cast-in-Place Manholes: Install an elastomeric waterstop gasket around each pipe extending through the manhole wall, and center each gasket in the wall to insure a watertight connection. Set pipe with installed gasket in place prior to placing concrete for the manhole base.

B. PIPE CONNECTIONS TO EXISTING MANHOLES

1. At locations where a new sewer pipe is to join an existing manhole, the work shall consist of making an opening in the manhole wall, inserting the new pipe and an elastomeric waterstop gasket to the elevation shown on the Drawings, constructing

necessary drop connections, and reconstructing the manhole invert. A drop pipe shall be provided for a sewer entering a manhole at an elevation of 24 inches or more above the manhole invert.

2. Core openings in the manhole for the pipe (the use of hammers not permitted). Install an elastomeric waterstop gasket in the cored opening between the manhole and pipe and repair the hole in the concrete wall with manhole patching material. The patching material shall extend a minimum of 1 inch beyond the inside and outside surface of the wall and a minimum of 3 inches beyond the edge of the hole. Utilize a Kor-N-Seal connector and non-shrink grout to repair the intrusion. The patch material shall cure for a minimum of one hour prior to wastewater flowing across it. The manhole shall also be lined from the invert to 1 foot above the top of the highest intrusion with an acceptable lining product. In the case that a manhole being cored is already lined, the lining shall be repaired in accordance with the original product manufacturer's requirements and recommendations. Manholes core-drilled for new connections shall undergo vacuum testing after installation of the Kor-N-Seal, but prior to the installation of non-shrink grout or lining. A vacuum test on the existing manhole is also recommended prior to starting work. A manhole with a passing test prior to work, or where a pre test was not completed will be required to pass a vacuum test when work is complete.

3. If the connecting pipe requires modification to the existing invert channel, the existing channel shall be removed to the extent necessary for a new invert channel to be constructed to provide a smooth flow through the manhole.

4. As approved by the Public Utility, the Contractor may temporarily block and/or divert sewage flows to facilitate construction operations. Otherwise, the Contractor shall provide bypass pumping around the manhole in question. No bypassing of sewage flows to ditches, streams, storm sewers, or the ground will be permitted.

C. Pipe Stub-Outs: Where shown on the plans or as directed by the Engineer, install pipe stub-outs in manholes for future extension or for service connections. Construct pipe stub-outs as specified above for pipe connections. Close or seal pipe stubs for future connections with a gasketed watertight plug or standard glued fitting. Unless otherwise noted, the stub-out pipe shall extend a minimum of 3 ft. from the edge of the manhole.

3.07 MANHOLE DROPS

A. Construct manhole drops at locations where the invert of the inlet sewer main pipe enters a manhole at a depth 24 inches or more above the invert of the outlet pipe. The pipe and fittings for the drops shall be of the same material, type, and size as the horizontal inlet pipe. The drops shall be constructed to the dimensions and in accordance with the details shown on the Drawings. The horizontal sewer pipe shall extend through the manhole wall. Concrete shall be used to backfill around the vertical pipe drops and fittings from the bottom of the excavation to 6 inches above the top of the horizontal inlet pipe.

B. Internal drops may be constructed in existing manholes if top to invert elevation is 15' or greater. All requests for internal drop construction shall be approved by the Owner and Engineer. Point of intrusion shall be re-sealed with an approved water stop and grouted in place, the top section fitting shall be an all Hub SDR 26 double sanitary tee with

direction of flow pointing downward. Vertical piping will be attached to concrete with 1 3/4" stainless steel bands by 5/8" X 3" stainless steel bolts with expansion anchors. Piping will terminate with a 90º long sweep bend resting on original invert base, fitting will be grouted in place on both sides to support assembly while forming new invert trough. Minimum pipe size for internal drop shall be 6".

3.08 REPAIR AND RECONSTRUCTION OF EXISTING MANHOLES

A. PREPARATION FOR REPAIRS

1. Prior to performing any work or repairs on the existing manhole, plug the pipes entering the manhole to prevent foreign material from entering the manhole or sewer pipe slated for repair. Pump the wastewater around the manhole to another downstream manhole. No bypassing of sewage flows to ditches, streams, storm sewers, or the ground will be permitted.

2. Remove foreign material from the manhole invert using a minimum 1,500 psi water spray. Pump out or otherwise remove cleaning water from the manhole and dispose in a downstream manhole as necessary.

B. INVERT CHANNEL REPAIRS

1. Where shown on the Drawings or as directed by the Engineer, repair broken or damaged manhole inverts using manhole patching material. Remove loose and protruding brick, mortar, and concrete using a mason's hammer and chisel, scraper, or other equipment approved by the Engineer. Fill or repair all holes, cracks, and other defective areas in the manhole invert using hand-applied manhole patching material.

2. Uniformly trowel a coating of manhole patching material onto the entire invert to a minimum thickness of 1/2 inch in an expeditious manner. Extra care shall be taken to ensure complete filling of the void at the pipe connection with manhole patching material. Extend the coating out onto the invert bench to the walls of the manhole or, if shown on the Drawings, a sufficient distance to tie into the manhole grout liner, which will be spray-applied following the invert repair work. The finished coated surfaces shall be smooth and free of ridges. Mix, handle, and apply of the patching material in accordance with the manufacturer's written recommendations. Allow the patching material to cure for a minimum of 30 minutes prior to allowing wastewater to flow across it.

C. REPAIRS TO EXISTING PIPE CONNECTIONS

1. Where shown on the Drawings or as directed by the Engineer, repair existing pipe connections. Remove the concrete, brick, or mortar around the pipe connection to the manhole to a minimum distance of 3 inches beyond the outside edge of the pipe and to minimum depth of 5 inches from the inside edge of the manhole wall. Install an elastomeric waterstop gasket around the sewer pipe and repair the hole and damaged manhole invert with manhole patching material.

D. MANHOLE GROUT LINER

1. Where shown on the Drawings or as directed by the Engineer, apply a manhole grout liner to the interior surfaces of the manhole walls and bench, from the manhole invert channel to the bottom of the cast iron manhole frame. Remove loose and protruding brick, mortar, and concrete using a mason's hammer and chisel, scraper, or other equipment approved by the Engineer.

2. Fill or repair all holes, cracks, and other defective areas in the manhole walls using hand-applied manhole patching material to a minimum thickness of 1/2 inch. Where shown on the Drawings or required by the Engineer, repair the invert as directed above. Perform such invert repair work prior to applying the grout liner.

3. The interior surfaces of the manhole walls shall be free of all foreign material and shall be totally saturated but without noticeable free water droplets or running water just prior to the application of the grout liner material. Perform the adding and mixing of water to the grout liner material, the application of the grout liner material to the manhole walls and bench, and the curing of the grout line in accordance with the manufacturer's written recommendations. Use only enough water to produce a mix with a consistency to allow application of liner material to a thickness of 1-inch in a single application without sagging on the vertical manhole surface.

4. Spray apply the grout liner material to the interior walls of the manhole to a minimum thickness of 1/2 inch in one or more passes starting at the bottom of the manhole and progressing to the top in a uniform manner. Hand trowel the surface to a relatively smooth finish being careful not to over trowel. Following troweling, give the surface a light broom finish. Spray the grout liner material to the bench to a minimum thickness of 1/2-inch to produce a uniform slope from the wall to the invert channel. Round the edges of the bench liner at the intersections with the wall and with the invert channel.

5. The equipment used to spray apply the grout liner material shall consist of a progressive cavity pump; an air system for low velocity spray application of the material; and shall be specifically designed for the intended purpose. The equipment shall be complete with water storage and metering system. All equipment shall be approved by the manufacturer of the liner material.

6. The Contractor applying the liner material shall be trained and certified by the particular manufacturer of the grout liner material in the use of the equipment and the procedures in the application of the liner. Such Contractor shall have a minimum of three (3) years' experience in the lining and repair of manholes.

3.09 MANHOLE GRADE ADJUSTMENT

A. Adjust existing manholes to grade by removal and replacement of the frame and cover; or by reconstruction, modification or replacement of the top portion of the structure as shown on the City of Bentonville Water Utilities Department Detail SS09.

3.10 REMOVING AND ABANDONING MANHOLES

A. Prior to the removal or abandonment of an existing manhole, remove the frames and covers and deliver them to the Public Utility. Plug all pipes entering the manhole with 4,000 psi concrete for a minimum distance of 12 inches from the inside wall of the manhole.

B. Remove designated manholes in their entirety including foundation or base unless otherwise noted on the Drawings or as directed by the Engineer. Dispose of all materials off-site and backfill the hole with compacted borrow.

C. For manholes designated to be abandoned that are greater than 5 feet in depth, remove the top portion of the manhole to a minimum depth of 2 feet below the adjacent surface and disposed of off-site. Fill the remaining portion of the manhole with Class 67 stone. Select Fill or other special backfill material shall be used where noted on the Drawings or as directed by the Engineer. See Section 02315, Excavation, Trenching and Backfilling for specifications on Slurry Backfill. Abandonment of manholes greater than 5 feet in depth shall adhere to the requirements specifically listed in this section shall meet all requirements found elsewhere in these specifications including but not limited to materials and the requirements of City of Bentonville Water Utilities Standard Detail SS07.

D. For manholes designated to be abandoned that are 5 feet deep or less, remove the manhole in its entirety including foundation or base unless otherwise noted on the Drawings or as directed by the Engineer. Dispose of all materials off-site and backfill the hole with compacted borrow.

3.11 ABANDONING PIPE CONNECTIONS TO EXISTING MANHOLES

A. At locations where an existing pipe is to be abandoned at an existing manhole, plug the end of the pipe at the manhole by packing the pipe with a low slump, non-shrink concrete or grout for a minimum distance of 12 inches from the inside wall of the manhole. Prior to performing any work on the manhole invert, plug the remaining pipes entering the manhole to prevent foreign material from entering the sewer pipe pump the wastewater around the manhole to another downstream manhole. Remove all foreign material from the manhole invert using a minimum 1,500 psi water spray.

B. Reshape the invert with manhole patching material to form a new smooth channel flow through the manhole and a new bench as required. The minimum thickness of the patching material shall be 1/2 inch, and the finished surfaces shall be smooth and free of ridges. Mix, handle, and apply the patching material in accordance with the manufacturer's written recommendations. Allow the patching material to cure for a minimum of 30 minutes prior to allowing wastewater to flow across it.

3.12 FIELD TESTING OF NEW MANHOLES

A. Vacuum test each new manhole prior to acceptance. Test manholes after piping connections have been made and prior to backfilling. Provide all vacuum pumps, gauges, testing equipment and plugs necessary for the testing of manholes. A City Inspector must be present for all testing to be approved. Repair any manholes that do not pass and retest.

B. Observe the following safety precautions:

1. No person shall be allowed in the manholes during the test or when a plugged pipe is under pressure.

2. Gauges, air piping manifolds and valves shall be located at the top of the ground. Install and brace all plugs securely.

C. Conduct tests in accordance with ASTM C1244 after all pipe connections have been made, and prior to backfilling the manhole. Temporarily plug all pipe penetrations using suitably sized pneumatic or mechanical plugs.

D. Place a metal cover with suitable gasket over the top of the manhole frame. The metal cover shall be provided with valved pipe connections for attaching the vacuum pipe and a vacuum gauge reading inches of mercury or psi. Apply a reduced pressure condition equal to 10 inches of mercury (5 psi). The manhole shall be considered as exhibiting adequate exfiltration if the pressure does not drop the equivalent of 1 inch of mercury in one minute

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SECTION 02535

POLYVINYL CHLORIDE (PVC) NON-PRESSURE SEWER PIPE

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required, and install and test polyvinyl chloride (PVC) sewer pipe and fittings, as shown on the Drawings and as specified herein.

B. Site piping shall include all piping and fittings extending outward, upward and downward into the ground from the outside face of all buildings and structures. Yard piping shall include all piping in manholes, cleanouts and similar yard structures.

C. Piping shall be located substantially as shown on the Drawings. The Engineer reserves the right to make modifications in piping locations and alignments to avoid interference between pipes or for other reasons. Pipe fitting notation is for the Contractor's convenience and does not relieve the Contractor from installing and jointing different or additional items where they are required to achieve a complete piping system.

D. Pipe or piping refers to all pipe, fittings, materials, and appurtenances required to construct PVC sewer pipelines unless otherwise noted.

1.02 MATERIALS COMPLIANCE WITH AIS

A. P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), includes an "American Iron and Steel (AIS)" requirement in section 436 that requires Clean Water State Revolving Loan Fund (CWSRF) and Drinking Water State Revolving Loan Fund (DWSRF) assistance recipients to use iron and steel products that are produced in the United States for projects for the construction, alteration, maintenance, or repair of a public water system or treatment works. This Project meets the definition of such work, and the Environment Protection Agency (EPA) implementation requirements for this AIS requirement are outlined within the DWSRF memorandum titled "Implementation of American Iron and Steel provisions of P.L. 113-76, Consolidated Appropriations Act, 2014" included as part of the RLF Supplemental General Conditions.

B. All parties are required to comply with these requirements and to ensure that all qualifying iron and steel products used in this project must be produced in the United States. See RLF Supplemental General Conditions for additional details.

1.03 RELATED SECTIONS

A. Section 01666 – Testing of Pipelines

B. Section 02315 – Excavation, Trenching, and Backfilling

C. Section 02316 – Ductile Iron Pipe and Fittings

D. Section 02530 – Sanitary Sewer

E. Section 02531 – Sanitary Sewer Manholes, Frames, and Covers

F. Section 03300 – Cast-in-Place Concrete

1.04 REFERENCE STANDARDS

A. ASTM International (ASTM), latest edition:

1. ASTM D1784 Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds

2. ASTM D2321 Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications

3. ASTM D3034 Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings

4. ASTM D3139 Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals

5. ASTM D3212 Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals

6. ASTM F477 Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe

7. ASTM F679 Standard Specification for Poly (Vinyl Chloride) (PVC) Large- Diameter Plastic Gravity Sewer Pipe and Fittings

8. ASTM F758 Standard Specification for Smooth-Wall Poly (Vinyl Chloride) (PVC) Plastic Underdrain Systems for Highway, Airport and Similar Drainage

9. ASTM F794 Standard Specification for Poly (Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter

10. ASTM F1803 Standard Specifications for Poly (Vinyl Chloride) (PVC) Closed Profile Gravity Pipe and Fittings Based on Controlled Inside Diameter

B. National Sanitation Foundation (NSF), latest edition:

1. Standard No. 14 Plastic Piping Components and Related Materials

C. Uni-Bell PVC Pipe Association (Uni-Bell), latest edition:

1. Uni-Bell Handbook for PVC Pipe Design and Construction

2. UNI-B-6 Recommended Practice for Low-Pressure Air Testing of Installed Sewer Pipe

1.05 SUBMITTALS

A. See Section 01300, Submittals for submittal procedures.

B. Product Data: Provide data on pipe materials, pipe fittings and accessories. Provide design calculations confirming that piping materials meet the required installation and operational conditions. All calculations shall be prepared and sealed by a Professional Engineer registered in the State where the project will be constructed.

C. Laying Schedule: Submit a tabulated laying schedule referencing stations and piping elevations as well as all fittings, service connections, cleanouts, adapters, solid sleeves, and specials. Include the manufacturer's detailed drawings and specifications. Show pipe class, station limits, and transition stations for various pipe classes. Submit the laying schedule to the Engineer for approval before manufacture and shipment.

D. Submit anticipated production and delivery schedule.

E. Manufacturer’s Certificate: Certify that pipe, fittings, gaskets, etc. meet or exceed the specified requirements of these specifications and the referenced ASTM and other standards.

1.06 QUALITY ASSURANCE

A. Furnish pipe from manufacturers experienced in the manufacture of the items. All PVC sewer pipe and fittings of a similar type (e.g. solid wall or profile wall) shall be from a single manufacturer.

B. Inspect and test all PVC pipe and fittings supplied for this project at the manufacturer as required by the standard specifications to which the material is manufactured. The supplier shall be responsible for the provisions of all test requirements specified in ASTM D3034 or ASTM F679 as applicable.

C. The Owner may elect to hire an independent testing laboratory, at the Owner’s expense, to inspect all pipe and fittings at the plant for compliance with these Specifications. The Contractor shall require the manufacturer's cooperation in these inspections.

D. Permanently mark all pipe and fittings with the following information:

1. Manufacturer and date
2. Size, type, class, or wall thickness
3. Standard produced to (ASTM, etc.)

E. The Engineer or representative of the Owner may inspect the pipe and fittings after delivery. The pipe will be subject to rejection at any time because of failure to meet any of the Specification requirements, even though sample pipes may have been accepted as satisfactory at the place of manufacture. The Engineer will mark pipe rejected after delivery for identification, and the Contractor shall remove the pipe from the project.

1.07 SYSTEM DESCRIPTION

A. The piping materials specified herein are intended to be of standard types for use in transporting sewage and for use as drainpipe for buildings or other structures as noted on the Drawings.

B. Note any supplementary information listed in pipe schedules on Drawings or in this Section, especially concerning pressures, minimum thickness, etc. In case of a conflict, information given in the pipe schedule shall govern.

C. Contractor is responsible for compatibility between pipe materials, fittings and appurtenances.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Comply with Division 1 Product Requirements.

B. Comply with manufacturer’s ordering instructions and lead time requirements to avoid construction delays.

C. Bundle or package all items in such a manner as to provide adequate protection of the ends during transportation to the site. Exercise care in loading, transporting, and unloading to prevent injury to the pipe. Do not drop or skid pipe joints against each other. Use padded slings, hooks or pipe tongs to prevent damage to the external surface of the pipe. Any pipe damaged in shipment shall be replaced as directed by the Engineer and at no additional cost to the Owner

D. Store materials protected from damage and exposure to harmful weather conditions. PVC items deteriorate in sunlight and are slightly brittle, especially at lower temperatures, so Contractor shall take care when loading, transporting and unloading items to prevent injury to the items. Examine all items before installation, and do not install any piecethat is found to be defective. Handle and install pipe and fittings in accordance with the manufacturer's instructions, the referenced standards, and as specified herein.

E. Any pipe or fitting showing a crack or which has received a blow that may have caused an incident fracture, even though no such fracture can be seen, shall be marked as rejected and removed at once from the work.

F. While stored, pipe shall be adequately supported from below at intervals of not more than 3 feet to prevent deformation. The pipe shall be stored in stacks no higher than that given in the following table:

Pipe Diameter (inches)	Maximum No. of Rows Stacked
8 or less	5
12 to 21	4
24 to 30	3
33 to 48	2
54 and larger	1

G. Pipe and fittings shall be stored in a manner that will keep them at ambient outdoor temperatures and out of the sunlight. The Contractor shall provide temporary shading as required to meet this requirement. Simple covering of the pipe and fittings that allows temperature buildup, or direct or indirect sunlight will not be permitted.

H. If any defective item is discovered after it has been installed, it shall be removed and replaced at the Contractor's own expense. All pipe and fittings shall be thoroughly cleaned before installation and the interior shall be kept clean until testing.

I. In handling the items, use special devices and methods as required to achieve the results specified herein. No uncushioned devices shall be used in handling the item.

1.09 COORDINATION

A. Coordinate the work of this Section with the work of other sections. Verify at the site both the dimensions and work of other trades adjoining items of work in this Section before commencement of items herein specified.

B. Furnish to the pertinent trades all items included under this Section that are to be built into the work of other sections.

C. Do not disrupt service to utility customers during installation of the piping improvements except for the time required to make connections to a new main.

D. Notify the Public Utility Department and Engineer at least 48 hours prior to scheduled connections of mains.

1.10 FIELD MEASUREMENTS

E. Take field measurements at the site to verify or supplement indicated dimensions and to ensure proper coordination of all other construction items.

PART 2 PRODUCTS

2.01 POLYVINYL CHLORIDE (PVC) PIPE AND FITTINGS

A. PVC solid wall gravity pipe and fittings shall be Type PSM, PVC SDR 26 Heavy Wall Sewer Pipe with full diameter dimensions and shall conform to ASTM D3034 for sizes 4 through 15-inch, and shall conform to ASTM F679 for sizes 18 through 36-inch. Furnish

straight pipe in lengths according to ASTM D3034, and furnish wyes in lengths of not more than 3 feet long. Saddle wyes will not be allowed.

B. PVC pipe and fittings shall have bell and spigot push-on joints. The bell shall consist of an integral wall section with a solid cross-section elastomeric gasket securely locked in place to prevent displacement during assembly. Installation of elastomeric gasketed joints and performance of the joint shall conform to ASTM F477, ASTM D3139 or ASTM D3212.

C. All fittings and accessories for sewers shall have bell and/or spigot configurations compatible with the pipe.

D. Sewer lines shall be green in color.

PART 3 EXECUTION

3.01 INSTALLATION OF PVC PIPE AND FITTINGS

A. No single piece of pipe shall be laid unless it is straight. The centerline of the pipe shall not deviate from a straight line drawn between the centers of the openings at the ends of the pipe by more than 1/16-inch per foot of length. If a piece of pipe fails to meet this requirement check for straightness, it shall be rejected and removed from the site. Laying instructions of the manufacturer shall be explicitly followed.

B. Defective pipe discovered after installation shall be removed and replaced with a sound pipe in a satisfactory manner at no additional cost to the Owner. Thoroughly clean all pipe and fittings before installation and keep installed piping clean until accepted by the Owner. Install PVC pipe and fittings in accordance with the requirements of the manufacturer, ASTM D2321, or as otherwise provided herein.

C. Excavate the trench to subgrade and place granular bedding, compacted and graded to provide firm, uniform and continuous support for the pipe. Excavate bell holes so that only the barrel of the pipe bears upon the bedding. Lay the pipe to the lines and grades indicated on the Drawings. Blocking under the pipe will not be permitted. Place granular bedding evenly on each side of the pipe to mid-diameter. Use hand tools to force the bedding under the haunches of the pipe and into the bell holes to give firm continuous support for the pipe. Place granular bedding to 12 inches above the top of the pipe. The initial 3 feet of backfill above the bedding shall be placed in 1-ft. layers and carefully compacted. Generally, conduct compaction efforts evenly on each side of the pipe, and do not operate compaction equipment directly over the pipe until sufficient backfill has been placed to prevent damage to the pipe. Equipment used in compacting the initial 3 feet of backfill shall be approved by the pipe manufacturer's representative prior to use.

D. All piping shall be sound and clean before installation. When installation is not in progress, including breaks and lunchtime, close the open ends of the pipe with a watertight plug or other approved means. The deflection at pipe joints shall not exceed that recommended by manufacturer. Fittings for alignment changes at existing utilities encountered during construction shall only be use with the permission of the Engineer.

E. Cut all pipe with a manufacturer-approved cutting machine, leaving a smooth cut at right angles to the axis of the pipe. Bevel the cut ends of pipe to be used with a bell to conform

to the manufactured spigot end and make a reference mark at the same distance from the pipe end as measured from a factory marked end from the same manufacturer.

F. The Engineer may examine each bell and spigot end to determine whether any preformed joint has been damaged prior to installation. Any pipe having defective joint surfaces shall be rejected, marked as such, and immediately removed from the job site.

G. Each length of the pipe shall have the assembly mark aligned with the pipe previously laid and held securely until enough backfill has been placed to hold the pipe in place.

H. Before installing a new pipe joint, check the pipe to ensure that a closed joint with the next adjoining pipe has been maintained, and that the inverts are matched and conform to the required grade. Do not drive the pipe down to grade by striking it.

I. Take all precautions to prevent flotation of the pipe in the trench.

J. When using moveable trench bracing such as trench boxes, moveable sheeting, shoring or plates to support the sides of the trench, care shall be taken in placing and moving the boxes or supporting bracing to prevent movement of the pipe, or disturbance of the pipe bedding and the backfill. As trench boxes, moveable sheeting, shoring or plates are moved, place additional pipe bedding to fill any voids created, and recompact the backfill to provide uniform side support for the pipe.

3.02 JOINTING PVC SEWER PIPE AND FITTINGS

A. Install pipe joints in strict accordance with the manufacturer's instructions. Lay pipe with bell ends looking ahead. Insert a rubber gasket in the groove of the bell end of the pipe, and clean and lubricate all joint surfaces. Insert the plain end of the pipe in alignment with the bell of the pipe to which it is to be joined, and push it home with a come-along or by other means. Check that the reference mark on the spigot end is flush with the end of the bell.

B. Make all manhole connections as shown on the Drawings and as specified in Section 02531. All manhole connections shall be equipped with an integral O-ring or other sealant, such that a positive watertight seal is established.

3.03 WYE BRANCHES AND MANHOLE STUBS

A. All pipe and associated fittings shall be furnished by the same manufacturer.

B. Furnish, install, and cap wye branches as shown on the Drawings or in locations directed by the Engineer. Block each wye branch and end cap with a 2”x 4” wood post that extends to a point 3 feet below the finished ground or by other means as approved by the Engineer.

C. Provide as-built locations for all wyes to the Engineer.

D. Pipe stubs for manhole connections shall not exceed 4 feet in length unless otherwise directed by the Engineer. Install caps where required.

3.04 SERVICE CONNECTIONS

A. Install service connections at a minimum slope of 2% at the locations shown on the Drawings and to the limits determined by the Engineer in the field. Block each wye branch and end cap with a 2”x 4” wood post that extends to a point 3 feet below the finished ground or by other means as approved by the Engineer.

B. Service connections shall be 4-inch diameter unless otherwise shown on the Drawings.

3.05 TESTING

A. Clean and test all piping in accordance with Section 01666, Testing of Pipelines. Submit a testing plan including detailed procedures, methods and equipment that will be used for pipeline testing at least 10 days before starting the testing for Engineer's review and approval. Furnish all necessary equipment and labor for carrying out the specified tests, and conduct all tests in the presence of the Engineer.

B. Furnish gauges, meters, pressure pumps, and other equipment necessary to test the lines.

3.06 CLEANING

A. At the conclusion of the work, thoroughly clean all of the pipe by flushing with water or other means to remove all dirt, stones, pieces of woods, or other material that may have entered during the construction period. Flush the lowest segment outlet last to assure debris removal.

END OF SECTION

SECTION 02634

HIGH DENSITY POLYETHYLENE (HDPE) PRESSURE PIPE

PART 1 GENERAL

1.01 SCOPE

A. This section covers furnishing and installation of 4 inch through 36 inch buried solid wall high density polyethylene (HDPE) pressure pipe. HDPE pressure pipe shall be furnished and installed complete with all fittings, jointing materials, anchors, blocking, encasement, and other necessary appurtenances.

B. Pressure and leakage tests and cleaning are covered in other sections. Pipe trenching, bedding, and backfill are covered in the Excavation, Trenching and Backfilling section.

1.02 MATERIALS COMPLIANCE WITH AIS

A. P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), includes an “American Iron and Steel (AIS)” requirement in section 436 that requires Clean Water State Revolving Loan Fund (CWSRF) and Drinking Water State Revolving Loan Fund (DWSRF) assistance recipients to use iron and steel products that are produced in the United States for projects for the construction, alteration, maintenance, or repair of a public water system or treatment works. This Project meets the definition of such work, and the Environment Protection Agency (EPA) implementation requirements for this AIS requirement are outlined within the DWSRF memorandum titled “Implementation of American Iron and Steel provisions of P.L. 113-76, Consolidated Appropriations Act, 2014” included as part of the RLF Supplemental General Conditions.

B. All parties are required to comply with these requirements and to ensure that all qualifying iron and steel products used in this project must be produced in the United States. See RLF Supplemental General Conditions for additional details.

1.03 SUBMITTALS

A. General Submittals.

1. Drawings and data shall be submitted in accordance with the Submittals Procedures section. Drawings and data shall include, but shall not be limited to, the items listed in this Section.

B. Pipe and Joint Data

1. Details of joints and connections

2. Pipe section length

3. Pipe Dimension Ratio

C. Certifications

1. Certification of compliance with NSF Standard No. 61 (for potable water system pipe)

2. Affidavit of Compliance (ANSI/AWWA C906, Sec. 6.3)

3. Verification, including Quality Assurance Testing (ANSI/AWWA C906, Sec. 5)

1.04 QUALITY ASSURANCE

A. Qualifications

1. The pipe manufacturer shall provide the services of an experienced, competent, and authorized representative to visit the site of the work to advise and consult with Contractor during joining and installation of the pipe. The manufacturer's representative shall not directly supervise Contractor's personnel, and Contractor shall remain responsible for the pipeline work.

B. Fusion

1. Fusion joints shall be made by qualified fusion technicians who shall demonstrate fusion experience on projects completed within a year of the Bid date which included similar or larger installation lengths, similar pipe sizes (+/- 2 pipe sizes) and similar DRs (+/- 2 DRs).

1.05 STORAGE AND HANDLING

A. Storage and handling shall meet the requirements of the Materials, Transporation and Handling section, and shall be in accordance with Chapter 7, Transportation, Handling and Storage of Pipe and Fittings of AWWA Manual M55, to ensure installation in sound, undamaged conditions. Pipe shall not be stored uncovered in direct sunlight.

PART 2 PRODUCTS

2.01 PERFORMANCE AND DESIGN REQUIREMENTS

A. Dimensions

1. Dimensions shall be as specified in the materials paragraph.

2.02 MATERIALS

Pipe	ANSI/ AWWA C906; material designation (ASTM D3350) PE3608 or PE4710, minimum cell classification 344464C, IPS (Iron Pipe Size). Pressure class and wall thickness Thermal butt fusion joints, ASTM D3261. Greenstriped.
Joints	Butt fusion joints, ASTM D3261; manufactured by injection molding; pressure class of the pipe or greater.
Fittings	
Electrofusion Type	ASTM F1055 having pressure class equivalent to the pipe or greater as required.
Molded or Fabricated Type	Meet applicable AWWA C906 requirements; pressure class and cell class equivalent to the pipe or greater as required.
Other Types	Subject to review by the Engineer.
Conductive Tracer	Detection tape, 3 inches wide; aluminum foil core, 0.5 mil thick, encased in a protective inert plastic jacket; 5,000 psi min tensile strength; 2.5 lb/inch per 1,000 feet min weight; color coded in accordance with APWA Uniform Color Code; Allen Systems "Detectatape", Lineguard "Type lll", or Reff Industries "Terra Tape D".

PART 3 EXECUTION

3.01 INSPECTION

A. Pipe and fittings shall be carefully examined for cracks and other defects immediately before installation, with special attention to pipe ends. All defective pipe and fittings shall be removed from the site of the work.

3.02 INSTALLATION

A. Laying Pipe

1. Pipe shall be protected from lateral displacement by pipe embedment material installed as specified in the Excavation, Trenching and Backfilling section. Pipe shall not be laid in water or under unsuitable weather or trench conditions, and shall be protected against entry of foreign matter.

2. During freezing weather, particular care shall be taken in handling and laying pipe to prevent damage by impact.

3. Whenever pipe laying is stopped, the open end of the line shall be closed with a tight-fitting end board to keep out sand and earth. The end board shall have several perforations near its center to admit water into the pipe, to prevent flotation in the

event the trench is flooded. Any standing water shall be removed from the trench before the end board is removed.

4. Pipe shall be protected from extended exposure to sunlight, shall be kept as cool as possible during installation, and shall be covered with backfill immediately after installation only during the cooler morning hours of the day.

5. Conductive tracer shall be buried above the center line of all HDPE pipe, not more than 18 inches below the ground surface unless otherwise directed by Engineer.

B. Cleaning

1. The interior of all pipe and fittings shall be thoroughly cleaned before installation and shall be kept clean until the work has been accepted.

C. Alignment

1. Piping shall be laid to the lines and grades indicated on the drawings. Pipelines or runs intended to be straight shall be laid straight. Deflections from a straight line or grade shall not exceed the maximum deflection specified by the manufacturer. Piping shall be laid in a manner that will not allow excessive amounts of condensate to collect at low points within the pipe.

2. Unless otherwise specified or indicated on the drawings, and subject to acceptance of the Engineer, either shorter pipe sections or fittings shall be installed as required to maintain the indicated pipeline alignment or grade.

D. Cutting Pipe

1. Cutting shall be in accordance with the pipe manufacturer's recommendations. Cuts shall be smooth, straight, and at right angle to the pipe axis. After cutting, the end of the pipe shall be dressed to remove all roughness and sharp corners and shall be beveled in accordance with the manufacturer's instructions.

E. Jointing

1. Jointing of pipe and fittings shall be performed in accordance with the instructions and recommendations of the pipe manufacturer and in accordance with ASTM F2620 and PPI TR 33. Sections of HDPE pipe shall be joined above ground into continuous lengths by the thermal butt fusion method.

2. Saddle fusion shall be performed in accordance with ASTM F2620 or PPI TR 41 and the fitting manufacturer’s recommendations.

3. Where required, electrofusion shall be performed in accordance with ASTM F1290, PPI TN 34, and the manufacturer recommended procedure.

4. Socket fusion and extrusion welding or hot gas welding will not be acceptable.

5. All joining procedures shall be acceptable to Engineer.

F. Connections with Existing Piping

1. Connections between new work and existing piping shall be made using suitable fittings. 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 the dewatered lines and excavations without damage to adjacent property.

2. Special care shall be taken to prevent contamination of potable water lines when dewatering, cutting into, and making connections with existing pipe. Trench water, mud, and other contaminating substances shall be kept out of the lines. The interior of all pipe, fittings, and valves installed in connections to existing piping shall be thoroughly cleaned and then swabbed in accordance with the requirements of AWWA C651.

G. Service Connections

1. Tapping saddles or tapping sleeves shall be used for all 2 inch and smaller service connections. Direct tapping of HDPE pipe will not be acceptable. Fittings shall be used for service connections larger than 2 inches.

H. Concrete Encasement

1. Concrete encasement shall be installed as indicated on the drawings. Concrete and reinforcing steel shall be as specified in the Cast-in-Place Concrete section. All pipes to be encased shall be suitably supported and blocked in proper position and shall be anchored against flotation.

I. Reaction Anchorage and Blocking

1. All tees and plugs installed in piping subject to internal hydrostatic head in excess of 30 feet shall be provided with suitable reaction blocking, anchors, joint harnesses, or other acceptable means of preventing movement of the pipe caused by internal pressure.

2. Concrete blocking shall extend from the fitting to solid undisturbed earth and shall be installed so that all joints are accessible for repair. The dimensions of concrete reaction blocking shall be as indicated on the drawings or as directed by Engineer.

3. Reaction blocking, anchorages, or other supports for fittings installed in fill or in other unstable ground shall be provided as indicated on the drawings or as directed by Engineer.

J. Protective Coating

1. All steel clamps, rods, bolts, and other metal components of tapping saddles or reaction anchorages subject to submergence or in contact with earth or other fill material, and not encased in concrete, shall be protected from corrosion by two coats of coal tar paint applied to clean, dry surfaces. The first coat shall be dry and hard before the second coat is applied.

3.03 FIELD QUALITY CONTROL

A. Hydrostatic Tests

1. After installation, HDPE piping shall be hydrostatically tested for defective workmanship and materials as specified in the Testing of Pipelines section.

B. Leakage

1. All HDPE piping shall be watertight and free from leaks. Each leak that is discovered within the correction period stipulated in the General Conditions shall be repaired by and at the expense of Contractor.

3.04 CLEANING

A. After installation, HDPE piping shall be cleaned as specified below.

B. Pipelines, including all associated valves and fittings, shall be cleaned to the satisfaction of Owner and Engineer.

C. Small pipelines shall be cleaned by flushing with water at the maximum velocity which can be developed, but not less than 3.0 feet per second 0.91 m/s, unless otherwise permitted by Engineer. Flushing shall continue until the pipeline is free of dirt, debris, and other foreign materials.

D. Large pipelines may be flushed as specified for small pipelines, cleaned with a hose, or cleaned by other methods acceptable to Engineer. Flushing or other cleaning methods shall continue until the pipeline is free of dirt, debris, and other foreign materials.

E. Flushing shall be accomplished through the installed valves or fittings, blow-offs or through temporary flushing connections installed for that purpose.

F. Booster pumps shall be used if needed to obtain the necessary volume or velocity of water. Pumping equipment installed under this Contract shall not be used for flushing, nor shall the flushing water be passed through them or other installed equipment; temporary bypass piping at each pump or installed equipment shall be provided as needed.

END OF SECTION

SECTION 02640

VALVES, HYDRANTS AND APPURTENANCES

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required to provide all buried and non-buried valves, valves in underground vaults, and appurtenances, complete with actuators and all accessories as shown on the Drawings and as specified herein.

B. Valves specifically excluded from this Section are as follows:

1. All interior valves for process piping
2. All valves for plumbing work
3. All valves for heating and ventilation work
4. All valves for fuel oil piping
5. All valves specifically included with equipment

1.02 MATERIALS COMPLIANCE WITH AIS

A. P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), includes an “American Iron and Steel (AIS)” requirement in section 436 that requires Clean Water State Revolving Loan Fund (CWSRF) and Drinking Water State Revolving Loan Fund (DWSRF) assistance recipients to use iron and steel products that are produced in the United States for projects for the construction, alteration, maintenance, or repair of a public water system or treatment works. This Project meets the definition of such work, and the Environment Protection Agency (EPA) implementation requirements for this AIS requirement are outlined within the DWSRF memorandum titled “Implementation of American Iron and Steel provisions of P.L. 113-76, Consolidated Appropriations Act, 2014” included as part of the RLF Supplemental General Conditions.

B. All parties are required to comply with these requirements and to ensure that all qualifying iron and steel products used in this project must be produced in the United States. See RLF Supplemental General Conditions for additional details.

1.03 RELATED SECTIONS

A. Section 01170 – Special Provisions

B. Section 01300 – Submittals

C. Division 3 – Concrete

D. Division 9 – Painting

E. Division 13 – Special Construction

F. Section 15100 – Valves and Appurtenances

G. Division 16 – Electrical

1.04 REFERENCE STANDARDS

A. Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.

B. American Society of Mechanical Engineers (ASME), latest edition:

1. ASME B16.1 Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250

C. American Water Works Association (AWWA), latest edition:

1. AWWA C111 Rubber-Gasket Joints for Ductile-Iron and Pressure Pipe and Fittings
2. AWWA C500 Metal-Seated Gate Valves, for Water Supply Service
3. AWWA C502 Dry-Barrel Fire Hydrants
4. AWWA C504 Rubber-Seated Butterfly Valves
5. AWWA C508 Swing-Check Valves for Waterworks Service, 2-In. Through 48-In. (50-mm Through 1200-mm) NPS
6. AWWA C509 Resilient-Seated Gate Valves for Water Supply Service
7. AWWA C512 Air-Release, Air/Vacuum, and Combination Air Valves for Water and Wastewater Service
8. AWWA C517 Resilient-Seated Cast-Iron Eccentric Plug Valves
9. AWWA C540 Power-Actuating Devices for Valves and Slide Gates
10. AWWA C550 Protective Interior Coatings for Valves and Hydrants

D. American National Standards Institute (ANSI), latest edition:

1. ANSI B16.1 Cast Iron Pipe Flanges and Flanged Fittings

E. ASTM International (ASTM), latest edition:

1. ASTM A48 Standard Specification for Gray Iron Castings
2. ASTM A126 Standard Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings

3. ASTM A153 Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

4. ASTM A276 Standard Specification for Stainless and Heat-Resisting Steel Bars and Shapes

5. ASTM A536 Standard Specification for Ductile Iron Castings

6. ASTM D2000 Standard Classification System for Rubber Products in Automotive Applications

F. Steel Structures Painting Council (SSPVC), latest edition:

1. SSPC SP-6 Commercial Blast Cleaning

1.05 SUBMITTALS

A. Submit materials required to establish compliance with these Specifications in accordance with Section 01300, Submittals, for shop drawings. Submittals shall include the following:

1. Manufacturer's literature, illustrations, specifications, and engineering data including:

a. Dimensions
b. Size
c. Materials of construction
d. Weight
e. Protection coating
f. Actuator weight
g. Calculations for actuator torque where applicable
h. Actuator wiring diagram including ladder diagrams and point-to-point wiring

B. Test Reports: Four (4) copies of all certified shop test results specified herein.

C. Operation and Maintenance Manuals: Including copies of all approved Shop Drawings.

D. Certificates: Certificates of compliance where required by referenced standards: For each valve specified to be manufactured and/or installed in accordance with AWWA and other standards, submit an affidavit of compliance with the appropriate standards, including certified results of required tests and certification of proper installation.

1.06 QUALITY ASSURANCE

A. Manufacturer's Qualifications:

1. Valves and appurtenances provided under this Section shall be the standard product in regular production by manufacturers whose products have proven reliable in similar service for at least five (5) years. If required, the manufacturer shall furnish evidence of installation in satisfactory operation.

2. All units of the same type shall be the product of one (1) manufacturer.

B. Design Criteria: All valves and appurtenances shall be new and in perfect working condition. Valves shall be designed for continuous use with a minimum of maintenance and service required and shall perform the required function without exceeding the safe limits for stress, strain, or vibration. In no case will used or damaged valves be acceptable. The selection of equipment to meet the specified design conditions is the responsibility of the Contractor. Both workmanship and material shall be of the very best quality and shall be entirely suitable for the service conditions specified.

C. Source Quality Control

1. Shop test valves in accordance with the referenced AWWA or other standard.

2. Obtain each type of valve from no more than one (1) manufacturer.

3. Plug valves shall be hydrostatically tested for 30 minutes at two-times the maximum working pressure, with no evidence of distress, leakage, or weeping. Plug valves shall be capable of providing drip tight shut-off up to the full pressure rating.

1.07 SYSTEM DESCRIPTION

A. General: All valves for buried piping or valves installed in vaults, as shown on the Drawings, shall be as specified in this Section.

1.08 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to the site to ensure uninterrupted progress of the Work.

B. Protect threads and seats from corrosion and damage. Rising stems and exposed stem valves shall be coated with a protective oil film that shall be maintained until time of use.

C. Furnish covers for all openings.

1. All valves 3-inch and larger shall be shipped and stored on site until time of use with wood or plywood covers on each valve end.

2. All valves smaller than 3-inch shall be shipped and stored as above except that heavy cardboard covers may be furnished instead of wood.

D. Store equipment to permit easy access for inspection and identification. Any corrosion in evidence at the time of Owner acceptance shall be removed, or the valve shall be removed from the job.

E. Store all equipment in covered storage off the ground.

1.09 COORDINATION

A. Review installation procedures under other Sections and coordinate with the work that is related to this Section including buried piping installation, site utilities, etc.

B. Coordinate the location and placement of concrete thrust blocks when required.

PART 2 PRODUCTS

2.01 GENERAL

A. All buried valves shall open counterclockwise.

B. The use of a manufacturer's name and/or model or catalog number is for the purpose of establishing the standard of quality and general configuration desired.

C. Valves shall be of the size shown on the Drawings or as noted and as far as possible, equipment of the same type shall be identical and from one (1) manufacturer.

D. Valves shall have the name of the maker, nominal size, flow directional arrows, working pressure for which they are designed and standard to which they are manufactured cast in raised letters on some appropriate part of the body.

E. Valves shall be rated for the adjoining piping system pressures as indicated on the Drawings. Unless otherwise noted, valves shall have a minimum working pressure of 200 psi or be of the same working pressure as the pipe they connect to, whichever is higher.

F. Valves shall be of the same nominal diameter as the pipe or fittings to which they are connected. Except as otherwise noted, joints shall be mechanical joints, with joint restraint where the adjacent piping is required to be restrained.

G. Valves shall be especially constructed for buried service.

2.02 VALVE BOXES

A. All buried valves shall be provided with extension shafts, operating nuts and valve boxes as follows:

1. Extension shafts shall be Type 304 stainless steel and the operating nut shall be 2-inch square. Shafts shall be designed to provide a factor of safety of not less than four. Extension shafts shall be required on any valve that exceeds 4’ in depth Operating nuts shall be pinned to the shafts.

2. Top of the operating nut shall be located 2 inches below the rim of the valve box.

3. Valve boxes shall be of the cast iron extension type. Boxes may be of the screw or sliding type, with a lap of 6 inches when in the most extended position. Lids shall be marked with the inscription "WATER" cast into the top depending on the associated line unless located at the tap for a fire line where a post indicator may not be installed. In this case the lid shall be marked “FIRE” and be painted safety red. The “FIRE” lid shall be locking and require only a wrench to open. Lids for sewer valves shall be marked with a “SEWER” inscription. Bases shall be of the proper size for the valve. Aluminum or plastic covers are not acceptable. A means of lateral support for the valve extension shaft shall be provided in the top portion of the valve box.

4. Valve boxes shall be Tyler 6850 series or equal with 5 1/4-inch shafts. Length variable 10 1/4-inch OD bottom flange, 8-inch ID Bottom, 7 3/16-inch OD top, 6 3/4-inch ID top of two (2) section valve box. .

5. The upper section of each box shall have a bottom flange of sufficient bearing area to prevent settling. The bottom of the lower section shall enclose the stuffing box and operating nut of the valve and shall be oval.

6. An approved operating key or wrench shall be furnished, except for when floor stands are required.

7. All fasteners shall be Type 304 stainless steel.

2.03 GATE VALVES

A. General:

1. Valves 2 1/2-inch and smaller shall be all bronze construction; valves 3-inch and larger shall be iron body, bronze mounted.

2. Unless otherwise specified on the Drawings, all gate valves shall conform to the requirements of AWWA C500 or C509, except as may be specifically modified herein.

B. Gate valves 2 1/2-inch and smaller:

1. Screwed ends, solid wedge, rising stem, and screwed-in bonnet with minimum nonshock working pressure of 150 psig.

2. Product and Manufacturer. Furnish valves as manufactured by one (1) of the following:

a. Stockham Model B103 or approved equal

2.04 RESILIENT SEATED GATE VALVES

A. Resilient seated gate valves shall be of cast iron or ductile iron, designed for a working pressure not less than 250 psig. Valves shall be manufactured in accordance with AWWA C515, similar and equal to Mueller Series 2361, American Flow Control Series 2500, Clow Valve Company Model 2638, or Mueller Company, Model A2361.

B. Valves shall be provided with a minimum of two O-ring stem seals and have a 2-inch square operating nut.

C. Valves shall open when the operating nut is turned to the left (counterclockwise).

D. Epoxy Coating shall be 8-mils DFT and free of voids.

E. Bonnet and gland bolts and nuts shall be either fabricated from a low alloy-steel for corrosion resistance or electroplated with zinc or cadmium. The hot-dip process in accordance with ASTM A153 is not acceptable.

F. Wedges shall be totally encapsulated.

G. Units shall be UL and FM approved.

H. The valve manufacturer shall furnish an affidavit that the gate valves have been manufactured and tested in accordance with AWWA C509.

2.05 TAPPING SLEEVES, TAPPING VALVES, AND TAPPING SADDLES

A. Tapping sleeves shall conform to Section 12.10 of the City of Bentonville Water Department Specifications 2024 Edition.

B. Field verify existing water line type and pipe O.D. before ordering the tapping sleeve.

C. Include a 3/4-inch NPT test plug, and pressure test the sleeve in the presence of the Engineer before commencing tap.

D. Outlet bolts and nuts shall be fabricated from corrosion resistant alloy.

E. Steel couplings shall be coated internally and externally with high build, high strength, Thermo-Set epoxy coating. The Thermo-Set epoxy coating shall be 8 - 10 mils DFT and free of voids. Or approved equal, prior to construction.

F. Tapping valves shall conform to the requirements specified above for gate valves except that one end shall be flanged and one mechanical. Tapping valves shall be provided with an oversized opening to permit the use of full-size cutters.

G. The valve manufacturer shall furnish an affidavit that the tapping valves have been manufactured and tested in accordance with AWWA C509.

H. Tapping saddles shall be made from iron, bronze, steel, or stainless steel and designed for a working pressure of at least 200 psig. Outlets shall be ANSI B16.1, Class 125 flanged tapping outlets, or as specified. Watertight seal shall be accompanied by the use of a gasket placed in a recess between the sleeve body and pipe barrel. The use of these Strap Saddle/Sleeves is restricted to taps where the branch is at least one size smaller than the run. Coatings on steel sleeves/saddles shall be high build, Thermo-Set Epoxy.

2.06 BUTTERFLY VALVES

A. Butterfly valves and operators shall conform to AWWA C504, Class 150B, except as specifically modified herein. Valves shall have a minimum 250-psi pressure rating or as noted on the Drawings and be manufactured by Dezurik, Val-Matic, Pratt, or equal.

B. Bolts and nuts shall be fabricated from low alloy-steel for corrosion resistance. Galvanized hardware is not acceptable.

C. Butterfly valves for below grade service shall be mechanical joint end with side gear operators as well as have an epoxy coated exterior.

D. Valve seats shall be full resilient seats retained in the body in accordance with AWWA C504.

E. Valve discs shall be constructed of ductile iron, ASTM A536. Discs shall be furnished with a 316 stainless steel seating edge to mate with the rubber seat. Seats shall be fully adjustable and replaceable with the valves in place for all valves 24-inch diameter and larger.

F. Valve body – Ductile iron, ASTM A536, Grade 65-45-12 with integrally cast hubs for shaft bearing housings of the through boss-type. Permanently self-lubricating body bushings shall be provided and shall be sized to withstand bearing loads. Stuffing box of liberal dimensions shall be provided at the operator end of the operator end of the vane shaft.

G. The valve shaft shall be of Type 316 stainless steel and designed for both torsional and shearing stresses when the valve is operated under its greatest dynamic or seating torque. No reductions of shaft diameter will be allowed except at the operator connection. Any reduction shall have a full radius fillet.

A. The valve manufacturer shall furnish an affidavit that the butterfly valves have been manufactured and tested in accordance with AWWA C504. Discs made from material other than bronze or stainless steel shall be coated with epoxy material. All other interior surfaces which are not stainless steel or bronze shall also be coated with epoxy material.

2.07 PLUG VALVES

A. All plug valves shall be of the eccentric type with bodies and plugs of cast-iron construction and shall meet the requirements of AWWA C517. Valves shall be rated for a minimum working pressure of 175 psig. The area at the valve port shall be at least 80 percent of the full pipe area. All valves shall open by turning counterclockwise.

B. Valves shall have balanced plugs with a resilient facing of neoprene solidly bonded thereto to assure bubble-tight shutoff.

C. Seats shall have a welded-in overlay of 99 percent (99%) pure nickel on all surfaces contacting the plug face.

D. Valves shall be furnished with bolted bonnets and self-adjusting vee-type packing. Packing shall be replaceable without disassembling the valve or removing the bonnet from the valve.

E. Corrosion-resistant, permanently lubricated bearings shall be provided at both ends of the valve shafts.

F. All valves shall be supplied with mechanical joint ends conforming to ASME B16.1, Class 125, unless otherwise noted herein or on the Drawings.

G. All exterior hardware on valves shall be of Type 316 stainless steel.

H. Plug valves shall be manufactured by DeZurik, Pratt or equal.

I. The valve manufacturer shall furnish an affidavit that the plug valves have been manufactured and tested in accordance with AWWA C517.

2.08 FIRE HYDRANTS

A. Fire hydrants shall be three-way with two (2) hose nozzles and one (1) pumper nozzle, similar and equal to Mueller Super Centurion 250 Fire Hydrant, Catalog No. A-421 or Clow Medallion. Hydrants shall be furnished with a mechanical joint base shoe, and all fittings shall be anchor type. Unless otherwise indicated on the Drawings, the inlet connection shall be 6-inch diameter.

B. Hydrants shall have incorporated in their design, a breakable connection feature including a safety stem coupling immediately above the bury line. This breakable connection shall have a lower breaking strength than the remainder of the unit.

C. Hydrants shall be furnished and set for a minimum depth of cover of 30 inches unless otherwise indicated on the Drawings. Provide the appropriate fire hydrant extension necessary to place the centerline of the pumper nozzle a minimum of 18 inches above finished grade. Where fire hydrant extensions are required, they shall be of the proper design to accommodate the make of fire hydrant installed.

D. The hydrant manufacturer shall furnish an affidavit that the fire hydrants have been manufactured and tested in accordance with AWWA C502.

E. Field paint hydrants with a color as approved by the Owner.

2.09 HYDROSTATIC PRESSURE RELIEF VALVES

A. Hydrostatic pressure relief valves shall be similar and equal to Troy Cast Iron Pressure Relief Valve Model A2550 Floor Type or Model A2580 Wall Type. The relief valve shall be constructed so that under normal operation, neither the cover nor strainer can become separated from the body of the valve. The relief valve shall be removable by disengaging locking lugs cast inside the valve body. The pressure relief valve shall open with a minimum head difference of 9 inches of water.

2.10 FLUSHING HYDRANTS

A. Flushing hydrants shall be of the non-freezing type with a 2-inch hose nozzle and a 2-inch FIP inlet. Flushing hydrants shall be set at the locations as shown in the Drawings and shall have a depth of bury that will meet the elevations given in the Drawing or a depth of 30 inches, whichever is greater. The hydrant shall have a locking operating rod and shall be serviceable from above grade. Flushing hydrants shall be Eclipse Model No. 77 Mainguard Hydrant as manufactured by the Kupferle Foundry Company or approved equal.

2.11 YARD HYDRANTS

A. Yard hydrants shall be the non-freezing type with a 1-inch inlet connection and a 3/4-inch hose coupling adapter. Yard hydrants shall be set at the locations as shown in the

Drawings and shall have a depth of bury that will meet the elevations given in the Drawings or depth of 30 inches, whichever is greater. Yard hydrants shall be Merrill Hi-Cap 1-inch, Anyflow or approved equal. Yard hydrants shall include a brass anti-siphon vacuum breaker.

2.12 SURFACE PREPARATION AND SHOP COATINGS

A. The interior ferrous metal surfaces for potable water service valves, except finished or bearing surfaces, shall be blast cleaned in accordance with SSPC SP-6 and painted with two coats of an approved two-component coal tar epoxy coating specifically formulated for potable water use. The coating used must appear on the current edition of the United States Environmental Protection Agency's list entitled "Accepted Categories and Subcategories of Coating, Liners and Paints for Potable Water Usage".

B. Exterior ferrous metal surfaces of all buried valves and hydrants shall be blast cleaned in accordance with SSPC SP-6 and given two shop coats of a heavy coal tar enamel or approved two-component coal tar epoxy paint.

C. Exterior ferrous metal surfaces of all nonburied valves shall be painted with one (1) coat of primer in accordance with the requirements of Section 09902, Finish Painting.

2.13 VALVE ACTUATORS – GENERAL

A. The valve and control gate manufacturer shall supply and integrally, rigidly mount all actuators, including any type of manual or powered actuators, on valves at the factory. The valves and their individual actuators shall be shipped as a unit.

B. Unless otherwise noted on the plans, non-buried process valves and control gates shall have a hand wheel mounted on the operator. Buried process valves shall have a 2-inch operating nut and extension stem unless otherwise noted on the plans.

C. All actuators shall be capable of moving the valve or control gate from the full open to full close position and in reverse and holding the valve at any position part way between full open or closed.

D. Each operating device shall have cast on it the word "OPEN" and an arrow indicating the direction of operation.

E. Where required by the installation, or as specified, provide the following: floor box; extended stem; floor stand and handwheel; position indicator and etched or cast arrow to show direction of rotation to open the valve; resilient, moisture-resistant seal around stem penetration of slab.

1. Floor boxes for operating nuts recessed in concrete shall be standard cast iron type, cast-in-place, with fastening top by Clow or equal.

2. Stem guides shall be of the adjustable wall bracket type, bronze bushed, with maximum spacing of 10-ft as manufactured by Clow; Rodney Hunt or approved equal. Extended operating nuts and/or stems shall have universal joints and pin couplings, if longer than 10-ft and a rating of at least five-times the maximum operating torque. Stem adapters shall be provided.

F. Gear Actuators

1. Unless otherwise noted, gear actuators shall be provided for the following: all valves of larger than 8-inch nominal diameter; all buried valves with operating shaft mounted horizontally (butterfly, plug, etc.) and where specified and/or indicated on the Drawings.

2. Gear actuators shall be of the worm or helical gear type with output shaft perpendicular to valve shaft, having a removable hand wheel mounted on the output shaft.

3. Actuators shall be capable of being removed from the valve without dismantling the valve or removing the valve from the line.

4. Gearing shall be machine-cut steel designed for smooth operation. Bearings shall be permanently lubricated, with bronze bearing bushings provided to take all thrusts and seals and to contain lubricants. Housings shall be sealed to exclude moisture and dirt, allow the reduction mechanisms to operate in lubricant and be of the same material as the valve body.

5. Manual operator input effort to the handwheel shall be a maximum of 40 ft-lbs for operating the valve from full open to full close, under any conditions. Gear actuators shall indicate valve position and have adjustable stops. Maximum handwheel size shall be 24-inch diameter.

G. All position indication and direction of opening arrows shall be embossed, stamped, engraved, etched, or raised decals.

2.14 SERVICE FITTINGS

A. See City of Bentonville Water and Sewer specifications, section 12.13 for information regarding service fittings.

PART 3 EXECUTION

3.01 INSPECTION AND PREPARATION

A. During installation of all valves, control gates, and appurtenances, verify that all items are clean, free of defects in material and workmanship and function properly.

B. All valves shall be closed and kept closed until otherwise directed by the Engineer.

3.02 INSTALLATION OF BURIED VALVES AND VALVE BOXES

A. Buried valves shall be cleaned and manually operated before installation. Buried valves and valve boxes shall be set with the stem vertically aligned in the center of the valve box. Valves shall be set on a firm foundation and supported by tamping pipe bedding material under the sides of the valve. The valve box shall be supported during backfilling and maintained in vertical alignment with the top flush with finish grade. The valve box shall be set so as not to transmit traffic loads to the valve.

B. Before backfilling, all exposed portions of any bolts shall be coated with two coats of bituminous paint comparable to Series 46H-413 Hi-Build Tneme-Tar by Tnemec Co., Inc.

C. Install valve floorstand operators with stainless steel bolts.

3.03 INSTALLATION OF TAPPING SLEEVES AND VALVES

A. The proper authority shall be contacted, and their permission granted prior to tapping a "live" line. The required procedures and timetable shall be followed exactly.

B. Installation shall be made under pressure and flow shall be maintained. The diameters of the tap shall be a minimum of 1/4-inch less than the inside diameter of the branch line.

C. The entire operation shall be conducted by workers experienced in the installation of tapping sleeves and valves. The tapping machine shall be furnished by the Contractor.

D. Determine the location of the line to be tapped to confirm that the proposed location will be satisfactory, and that no interference will be encountered such as joints or fittings. No tap or sleeve will be made closer than three feet from a pipe joint.

E. Tapping sleeve and valve with boxes shall be set squarely centered on the line to be tapped. Adequate support shall be provided under the sleeve and valve during the tapping operation. Thrust blocks or other permanent restraint acceptable to the Engineer shall be provided behind all tapping sleeves. Proper tamping of supporting pipe bedding material around and under the valve and sleeve is mandatory for buried installations.

F. After completing the tap, the valve shall be flushed to ensure that the valve seat is clean. All proper regulatory procedures (including disinfection) shall be followed exactly.

G. All taps 12 inches or smaller on existing mains shall be performed by the Bentonville Water Utilities Department. Taps larger than 12 inches must be completed by a Bentonville Water Utilities Department approved contractor. Request for taps to be performed by the Bentonville Water Utilities Department or approved contractor shall be made at least 24 hours in advance. The Contractor shall provide material for all taps and shall be responsible for excavation and installation of valve and tapping sleeves unless directed otherwise by the Bentonville Water Utilities Department. The Contractor shall provide two pressure tests prior to execution of the tap. Two pressure tests, as defined herein, at 200 psig with no loss for 15 minutes or in areas of higher pressure test to 1.5 times the operating pressure with no loss for 15 minutes and shall be witnessed and recorded by a City of Bentonville Inspector or Bentonville Water Utilities Department representative. The first pressure test shall be with the valve closed and without a test plug, and the second pressure test shall be with the valve open and a test plug. Testing equipment shall be inspected by a City of Bentonville Inspector and shall be in proper working order at time of test. Tap locations on pipe sizes 6 inches to 12 inches will be no closer than 24 inches to the back of the bell or collar of the pipeline and no closer than 24 inches from the insertion line on the spigot end of the pipeline.

3.04 FIELD TESTS AND ADJUSTMENTS

A. Conduct a functional field test of each valve, including actuators and control equipment, in presence of Engineer to demonstrate that each part of all components together functions correctly. All testing equipment required shall be furnished by the Contractor.

3.05 MANUFACTURER'S SERVICE

A. Furnish the services of a qualified representative of the tapping equipment manufacturer to provide on-site instruction during wet tapping of the existing water mains indicated on the Drawings.

END OF SECTION

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SECTION 02821

CHAIN LINK FENCES AND GATES

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment, and incidentals required; and install framework, fabric and accessories for chain link fences and gates.

B. Scope of Work includes installation of non-motorized cantilever slide gates and related hardware. Motorized cantilever slide gates are specified elsewhere.

1.02 MATERIALS COMPLIANCE WITH AIS

A. P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), includes an “American Iron and Steel (AIS)” requirement in section 436 that requires Clean Water State Revolving Loan Fund (CWSRF) and Drinking Water State Revolving Loan Fund (DWSRF) assistance recipients to use iron and steel products that are produced in the United States for projects for the construction, alteration, maintenance, or repair of a public water system or treatment works. This Project meets the definition of such work, and the Environment Protection Agency (EPA) implementation requirements for this AIS requirement are outlined within the DWSRF memorandum titled “Implementation of American Iron and Steel provisions of P.L. 113-76, Consolidated Appropriations Act, 2014” included as part of the RLF Supplemental General Conditions.

B. All parties are required to comply with these requirements and to ensure that all qualifying iron and steel products used in this project must be produced in the United States. See RLF Supplemental General Conditions for additional details.

1.03 RELATED SECTIONS

A. Section 01300 – Submittals

B. Section 03300 – Cast-In-Place Concrete

1.04 REFERENCE STANDARDS

A. ASTM International (ASTM), latest edition:

1. ASTM A121 Standard Specification for Zinc-Coated (Galvanized) Steel Barbed Wire

2. ASTM A123 Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

3. ASTM A153 Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

4. ASTM A392 Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric

5. ASTM F567 Standard Practice for Installation of Chain-Link Fence.

6. ASTM F626 Standard Specification for Fence Fittings.

7. ASTM F668 Standard Specification for Polyvinyl Chloride (PVC) and Other Organic Polymer-Coated Steel Chain-Link Fence Fabric

8. ASTM F1043 Standard Specification for Strength and Protective Coatings on Metal Industrial Chain Link Fence Framework

9. ASTM F1083 Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures.

10. ASTM F1665 Standard Specification for Poly (Vinyl Chloride) (PVC)and Other Conforming Organic Polymer-Coated Steel Barbed Wire Used With Chain-Link Fence

B. Chain Link Fence Manufacturers Institute (CLFMI), latest edition:

1. CLFMI CLF 2445 Product Manual

1.05 SUBMITTALS

A. See Section 01300, Submittals, for submittal procedures.

B. Product Data: Provide data on fabric, posts, accessories, fittings, and hardware.

C. Shop Drawings: Indicate plan layout, spacing of components, post foundation dimensions, hardware anchorage, and schedule of components.

D. Manufacturer’s Installation Instructions: Indicate installation requirements.

E. Project Record Documents: Accurately record actual locations of property perimeter posts relative to property lines.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of experience.

1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, and handle structural steel without damaging finish.

B. Delivered manufactured materials in original unopened packages, containers, or bundles with manufacturer’s label intact and legible.

C. Store materials off ground, under cover, and away from damp surfaces.

D. Remove from the job site any damaged, unlabeled, or unsatisfactory materials that do not meet this specification.

1.08 COORDINATION

A. Coordinate the work of this section with the work of other sections. Verify at the site both the dimensions and work of other trades that adjoin the work specified in this section.

B. Furnish to the pertinent trades all items included under this section scheduled for inclusion in the work of other sections.

1.09 FIELD MEASUREMENTS

A. Take field measurements at the site to verify or supplement indicated dimensions and to ensure proper coordination of all other construction items.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Master-Halco, Inc. (Anchor Fence)

B. Merchants Metals

C. Contractor shall request to the Engineer in writing any other manufacturers for approval.

2.02 MATERIALS

A. Conform to CLFMI Product Manual.

B. Coated Posts, Rails, and Frames: Type I, round and conforming to ASTM F1083 Schedule 40, welded construction, with a minimum yield strength of 30,000 psi and minimum tensile strength of 48,000 psi. Hot-dipped galvanized inside and out with a minimum coverage of 1.8 oz./sq.-ft. of coated surface. PVC-coated, 10 to 15 mil thickness, in accordance with ASTM F1043, similar and equal to the Colorbond System as manufactured by Merchant Metals. Color: black.

C. Coated Wire Fabric: PVC-coated, 6 to 10 mil thickness, thermally fused to zinc-coated steel wire per ASTM F668, Class 2b; similar and equal to Colorbond System as manufactured by Merchants Metals. Color: black.

D. Coated Barbed Wire: PVC-coated per ASTM F1665, Class 2a steel wire; 3 strands of 13 3/4-gauge (0.083-inch) wire, with 14-gauge galvanized 4-point barbs (without PVC finish) at 5-inches on center.

E. Concrete: Class B (3,500 psi) as specified in Section 03300, Cast-In-Place Concrete.

2.03 COMPONENTS

A. Line Posts: Type I, 2 3/8-inch (3.65-lbs./ft.) diameter.

B. Corner and Terminal Posts: 4-inch (9.12-lbs./ft.) diameter.

C. Gate Posts: 4-inch (9.12-lbs./ft.) diameter.

D. Top and Brace Rail: 1 5/8-inch (2.27-lbs./ft.) diameter, plain end, sleeve coupled.

E. Gate Frame: 2 3/8-inch (3.65-lbs./ft.) diameter, or 2-inch square steel tubular (2.60-lbs./ft.) for welded fabrication.

F. Fabric: 2-inch diamond mesh interwoven wire, 9-gauge thick, top selvage twisted tight, bottom selvage knuckle end closed.

G. Tension Wire: 7-gauge steel, single strand.

H. Tension Bar: 0.188-inch by 3/4-inch steel.

I. Tension Band: 14-gauge by 3/4-inch steel.

J. Tie Wire: 12-gauge galvanized steel or 9-gauge aluminum wire.

K. PVC coat all galvanized components for use with PVC-coated fencing systems.

2.04 ACCESSORIES

A. Caps: Cast steel galvanized; sized to post diameter.

B. Fittings: Sleeves, bands, clips, rail ends, tension bars, fasteners, and fittings; steel.

C. Extension Arms: Steel galvanized to accommodate 3 strands of barbed wire, single arm, sloped to 45-degrees.

D. PVC coat all galvanized components for use with PVC-coated fencing systems.

2.05 FINISHES

A. Hardware: Hot-dip galvanized to weight required by ASTM A153.

B. Accessories: Same finish as framing.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install framework, fabric, and accessories in accordance with ASTM F567.

B. Place fabric on outside of posts and rails.

C. Set corner, intermediate, terminal, and gate posts plumb in concrete footings with top of footing above finished grade. Slope top of concrete for water runoff.

D. Line Post Footing Depth Below Finished Grade: 3-feet.

E. Corner, Gate and Terminal Post Footing Depth Below Finished Grade: 3-feet.

F. Brace each gate and corner post to adjacent line post with horizontal center brace rail. Install brace rail one (1) bay from end and gate posts.

G. Provide top rail through line post tops and splice with 6-inch long rail sleeves.

H. Install center and bottom brace rail on corner gate leaves.

I. Do not stretch fabric until concrete foundation has cured 7 days.

J. Stretch fabric between terminal posts or at intervals of 100-ft. maximum, whichever is less.

K. Position bottom of fabric 1 to 4-inches above finished grade.

L. Fasten fabric to top rail, line posts, braces, and bottom tension wire at maximum 15-inches on centers.

M. Attach fabric to end, corner, and gate posts with tension bars and tension bands.

N. Install bottom tension wire stretched taut between terminal posts.

O. Install support arms sloped outward and attach barbed wire, tension and secure.

P. Install gate with fabric to match fence. Install hardware.

Q. Maintain accurate position and fence alignment. Preserve and protect all survey and right-of-way markers and monumentation.

3.02 ERECTION TOLERANCES

A. Maximum Variation from Plumb: 1/4-inch

B. Maximum Offset From True Position: 1-inch

C. Components shall not infringe adjacent property lines.

END OF SECTION

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SECTION 02920

SEEDING

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment, and incidentals; place topsoil; provide finish grading; and apply lime, fertilizer, seed, mulch and water on all areas that have been disturbed by construction work.

1.02 MATERIALS COMPLIANCE WITH AIS

A. P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), includes an “American Iron and Steel (AIS)” requirement in section 436 that requires Clean Water State Revolving Loan Fund (CWSRF) and Drinking Water State Revolving Loan Fund (DWSRF) assistance recipients to use iron and steel products that are produced in the United States for projects for the construction, alteration, maintenance, or repair of a public water system or treatment works. This Project meets the definition of such work, and the Environment Protection Agency (EPA) implementation requirements for this AIS requirement are outlined within the DWSRF memorandum titled “Implementation of American Iron and Steel provisions of P.L. 113-76, Consolidated Appropriations Act, 2014” included as part of the RLF Supplemental General Conditions.

B. All parties are required to comply with these requirements and to ensure that all qualifying iron and steel products used in this project must be produced in the United States. See RLF Supplemental General Conditions for additional details.

1.03 RELATED SECTIONS

A. Section 01111 – Site Conditions

B. Section 01300 – Submittals

C. Section 02100 – Site Preparation

D. Section 02370 – Erosion and Sedimentation Control

E. Section 02921 – Sodding

1.04 SUBMITTALS

A. See Section 01300, Submittals, for submittal procedures.

B. Submit material and equipment furnished under this Section including seed mixtures and product label information in accordance with Section 01300, Submittals. Seed certificates shall include guaranteed percentages of purity, weed content, and germination, and shall indicate the net weight and date of shipment. No seed shall be sown until the certificates have been submitted.

C. Submit samples of all materials for inspection and acceptance upon request by the Engineer.

1.05 COORDINATION

A. Coordinate the work of this Section with the work of other sections. Verify at the site both the dimensions and work of other trades adjoining items of work in this Section before commencement of items herein specified.

1.06 FIELD MEASUREMENTS

A. Take field measurements at the site to verify or supplement indicated dimensions and to ensure proper coordination of all other construction items.

PART 2 PRODUCTS

2.01 MATERIALS

A. Topsoil shall be fertile, friable, loamy surface soil without admixture and free of stones, stumps, roots, sticks, debris, and clay balls greater than 1 inch in diameter. Topsoil shall be stripped from naturally well drained sites and be free of noxious weeds and other materials deleterious to plant growth. It shall have a pH range of 5.5 to 7.5 and have a minimum organic content of 6 percent (6%).

B. Lime shall be agricultural grade ground limestone or approved equivalent, containing not less than 85 percent (85%) calcium and magnesium carbonates.

C. Fertilizer shall be a commercial grade, 10-20-10 (N-P_2O_5-K_2O), uniform in composition, suitable for application with mechanical equipment, and conforming to state fertilizer laws. Deliver fertilizer to the site in original, unopened containers, bearing the name, trademark, and manufacturer's guaranteed analysis. Store fertilizer so that it remains dry and free flowing.

D. The seed shall be labeled in accordance with current rules and regulations of the Arkansas State Plant Board, shall have a minimum of 98 percent (98%) pure seed and 85 percent (85%) germination by weight, and shall contain no more than 1 percent (1%) weed seeds. A combined total of 50 noxious weed seeds shall be the maximum amount allowed per pound of seed with the following exceptions: Johnson grass seed, wild onion seed, wild garlic seed, field bindweed seed or nut grass seed will not be allowed in any amount whatsoever. Deliver seed in original, unopened containers, bearing the name, trademark and warranty of the producer. Seed that has become wet, moldy or otherwise

damaged in transit or in storage will not be acceptable. Apply grass seed, composed of the following varieties (premixed), at the rates shown in Table 1.

Table 1
Seed Varieties and Application Rates

Dates	Variety	Lb/Acre
Mar. 15 – Jun. 15	Bermuda Grass (Common) unhulled	25
	Bermuda Grass (Common) hulled	25
	Red Fescue	20
	Annual Rye	30
Jun. 15 – Sep. 15	Bermuda Grass (Common) unhulled	25
	Bermuda Grass (Common) hulled	25
	Red Fescue	20
Sep. 15 – Nov. 15	Bermuda Grass (Common) unhulled	10
	Red Fescue	20
	Annual Rye	30

E. Mulch cover shall consist of straw from threshed rice, oats, wheat, barley, or rye; of wood excelsior; or from hay obtained from various legumes or grasses, such as lespedeza, clover, vetch, soybeans, Bermuda, carpet sedge, Bahia, fescue, or a combination thereof. Mulch shall be dry and reasonably free from Johnson grass or other noxious weeds and shall not be excessively brittle or in an advanced state of decomposition. All material will be inspected and approved prior to use.

F. Hydraulically applied mulch shall be a specially processed cellulose fiber containing no growth or germination-inhibiting factors. It shall be manufactured in such a manner that after addition and agitation in slurry tanks with water, the fibers in the material become uniformly suspended in a homogenous slurry. When sprayed on the ground, the material shall allow adsorption and percolation of moisture. Each package of cellulose fiber shall be marked by the manufacturer to show the air-dry weight content.

G. Water shall be of irrigation quality and free of impurities that would be detrimental to plant growth.

PART 3 EXECUTION

3.01 GENERAL

A. Seeding shall consist of furnishing and applying seed, mulch, water, and fertilizer on all areas that have been disturbed by the construction work. These areas shall include lawns, pastures, ditches, ditch banks, embankment areas, compacted fill areas, cut or fill slopes and any area disturbed by construction.

B. Perform soil conditioning, seeding, and mulching only during those periods within the season that are normal for such work as determined by the weather and locally accepted practice, as approved by the Engineer. Hydroseed only on calm days.

C. Submit schedules for seeding and fertilizing to the Engineer for approval prior to the work.

3.02 SEED BED PREPARATION

A. Remove all excess dirt, construction materials, trees, rubbish, debris, roots, stumps, and rocks larger than 2 inches and dispose of off-site. Dress areas to be seeded to the lines and grades shown on the plans, and rake to loosen the subgrade immediately prior to the application of topsoil. Subgrade shall be inspected and approved by the Engineer before topsoil is placed.

B. Obtain soil samples, to a depth of 5 inches, from each major soil area, and have lime and fertilizer requirement analyses conducted.

C. Unless otherwise shown on the Drawings, place topsoil to a minimum depth of 6 inches on all parts of the site not covered with structures, pavement, or existing vegetation. Place topsoil over approved areas to a depth sufficiently greater than required so that after natural settlement and light rolling, the complete work will conform to the lines, grades and elevations shown on the Drawings or as directed by the Engineer. Do not handle, move, or spread topsoil when it is frozen or muddy.

3.03 APPLICATION OF TOPSOIL AMENDMENTS AND SEED

A. Lime

1. Apply lime at the rate determined by the lime requirement test to bring topsoil pH to a range of 5.5 to 7.5.

2. Uniformly spread lime and then thoroughly pulverize the seedbed by means of disk harrows, hand raking, or other approved methods, thoroughly mixing lime and soil to a depth of 4 inches. Remove rocks, large clods, lumps, brush, roots, litter, and other objectionable foreign matter turned up during mixing, and apply water to maintain the desired moisture content in the soil. Follow disk harrowing with a spiked-tooth harrow to provide a finer surface texture.

B. Fertilizing

1. Apply fertilizer at a rate determined by the soil test and not less than 800 lb/acre unless approved by the Engineer.

2. Apply fertilizer uniformly and incorporate it into the soil to a depth of at least 2 inches. Fertilizer may be worked into the soil alone or in conjunction with the required lime. The fertilizer may be broadcasted, drilled into the soil, or combined with the seed in a hydroseeding operation.

3. The application of fertilizer and lime may be performed hydraulically in one operation with hydroseeding and mulching. If lime, fertilizer, and seed are applied hydraulically, the Contractor is responsible for cleaning all structures and paved areas of unwanted deposits at no additional cost to the Owner.

4. Roll the prepared surface with a hand roller weighing not more than 100 lb/ft. of roller width. Refill with additional topsoil, regrade all depressions caused by settlement during rolling, and reroll until smooth.

C. Seeding

1. Place seed either by broadcasting, drilling or by hydroseeding, and within ten (10) days following soil preparation. Broadcast sowing may be accomplished by hand seeders or approved power equipment, and either method shall result in a uniform distribution of seed. No broadcast seeding shall be performed during periods of high winds.

2. When the seed is drilled, it shall be in rows parallel to the toe of the slope, and drills shall not be more than 6 inches apart. Fertilizer and seed shall not be drilled together and shall not be mixed.

3. If a hydroseeder is used, fertilizer and seed may be applied into one operation, but a maximum of 800 lb of fertilizer shall be permitted per each 1,500 gallons of water. The area shall be lightly compacted with a cultipacker immediately prior to hydroseeding. Prior to the start of work, submit to the Engineer a certified statement as to the number of pounds of materials to be used per 100 gallons of water. This statement shall also specify the number of square feet of seeding that can be covered with the quantity of solution in the hydroseeder.

D. Mulching

1. Apply mulch cover at a rate of 4,000 lb/acre immediately after seeding.

2. Spread mulch uniformly over the entire area by approved power mulching equipment. The Contractor may apply mulch by hand methods to cover small or inaccessible areas as approved by the Engineer.

3. If the Contractor so elects, an approved mulching machine may be used whereby the application of mulch cover and tackifier may be combined into one (1) operation. If this method is used, no change in application rates will be allowed. Mulch shall be anchored or otherwise stabilized to hold the mulch in place until the seedbed has germinated. Anchored mulch shall be loose enough to allow air to circulate but compact enough to partially shade the seed bed and reduce any detrimental impact of rainfall on the soil surface. Asphalt may not be used as an anchoring agent.

4. Prevent the mulch tackifier material from discoloring or marking structures, pavements, utilities, or other plant growth. Contractor is responsible for cleaning all structures and paved areas of unwanted deposits at no additional cost to the Owner.

5. Mulch that is windblown or otherwise disturbed shall be replaced and the excess shall be promptly removed from the site.

E. Water

1. After application of the mulch cover, apply water in sufficient quantity to thoroughly moisten the soil to a depth of pulverization and as necessary to germinate the seed and maintain growth at the direction of the Engineer until the completion and acceptance of the project by the Owner. The time required for application of water will not be included in the computations of contract time for completion of the project provided all other work under the contract has been completed.

2. Water used in the seeding operation will not be furnished by the Owner. Make provision to obtain water for this operation at no additional cost to the Owner.

F. Reseeding

1. After germination has occurred, any area that does not have a stand of established grass shall be refertilized, reseeded and watered in accordance with the application instructions listed above, and at no additional cost to the Owner. Any portions of the seeded area that erodes, becomes gullied or otherwise is damaged shall be repaired to achieve an acceptable stand of grass at no additional cost to the Owner.

3.04 EROSION CONTROL

A. Install seeding as soon as construction work is completed to prevent unnecessary erosion of newly restored work areas and silting of drainage ways.

B. When newly graded subgrade areas cannot be topsoiled and seeded because of season or weather conditions, and when they will remain exposed for more than 14 days, protect those areas against erosion and washouts by temporary seeding and mulching. Prior to application of topsoil, thoroughly incorporate any such erosion control material into the subgrade by discing.

C. Provide protection of slopes against washouts by an approved method in accordance with Section 02370, Erosion and Sedimentation Control. Regrade and reseed all washouts that occur until a good grass coverage is established at no additional cost to the Owner.

3.05 SEEDING IN WOODED AND UNGRADED AREAS

A. For preparation and seeding in wooded areas under this Contract and where no grading is required, all specified materials and procedures shall be utilized except that no disking shall be performed within the drip line of trees to be preserved. The seed bed shall be prepared by the addition of a thin layer of topsoil roughly 1 inch deep.

3.06 CLEANUP

A. Prior to final acceptance and payment, the Contractor shall remove all machinery, equipment, surplus materials, rubbish, etc., from the project. Clean pavements, driveways, sidewalks, and storm drainage facilities, and remove surplus soil and debris.

3.07 MAINTENANCE AND PROVISIONAL ACCEPTANCE

A. Keep all seeded areas watered and in good condition, reseeding if and when necessary, until a good, healthy, uniform growth is established over the entire area. Maintain these areas in an approved condition including a minimum of two (2) mowings of all seeded and restored areas until provisional acceptance by the Owner.

B. The Engineer will inspect all work for provisional acceptance at the end of the 8-week grass maintenance period, upon the written request, received at least ten (10) days before the anticipated date of inspection.

C. A satisfactory stand of grass will be defined as a section of grass of 10,000 ft^2 or larger that has:

1. No bare spots larger than 3 ft^2

2. No more than 10 percent (10%) of total area with bare spots larger than 1 ft^2

D. Furnish full and complete written instructions for maintenance of the seeded and restored areas to the Owner at the time of provisional acceptance.

E. The inspection by the Engineer will determine whether maintenance shall continue in any area or manner.

F. After all necessary corrective work and cleanup has been completed and maintenance instructions have been received by the Owner, the Engineer will certify in writing the provisional acceptance of the seeded and restored areas. Maintenance of seeded and restored areas shall cease on receipt of provisional acceptance, except that the Contractor shall groom and mow all restored areas immediately prior to Final Acceptance by the Owner.

END OF SECTION

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SECTION 02921

SODDING

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment, and incidentals as required to place and grade topsoil; and to apply lime, fertilizer, sod, and water on all disturbed areas as indicated on the Drawings.

B. Areas disturbed by construction that are not specifically indicated for sod restoration on the Drawings shall be restored by seeding.

1.02 MATERIALS COMPLIANCE WITH AIS

A. P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), includes an “American Iron and Steel (AIS)” requirement in section 436 that requires Clean Water State Revolving Loan Fund (CWSRF) and Drinking Water State Revolving Loan Fund (DWSRF) assistance recipients to use iron and steel products that are produced in the United States for projects for the construction, alteration, maintenance, or repair of a public water system or treatment works. This Project meets the definition of such work, and the Environment Protection Agency (EPA) implementation requirements for this AIS requirement are outlined within the DWSRF memorandum titled “Implementation of American Iron and Steel provisions of P.L. 113-76, Consolidated Appropriations Act, 2014” included as part of the RLF Supplemental General Conditions.

B. All parties are required to comply with these requirements and to ensure that all qualifying iron and steel products used in this project must be produced in the United States. See RLF Supplemental General Conditions for additional details.

1.03 RELATED SECTIONS

A. Section 01111 – Site Conditions

B. Section 01300 – Submittals

C. Section 02100 – Site Preparation

D. Section 02370 – Erosion and Sedimentation Control

E. Section 02920 – Seeding

1.04 SUBMITTALS

A. See Section 01300, Submittals, for submittal procedures.

B. Product Data: Submit samples of all materials for inspection and acceptance upon request by the Engineer. Include sod grower's name, location, and grass type for review and approval prior to delivery of sod to the site.

C. Submit complete written instructions for maintenance of the sodded areas to the Owner at the time of acceptance.

1.05 COORDINATION

A. Coordinate the work of this Section with the work of other sections. Verify at the site both the dimensions and work of other trades adjoining items of work in this Section before commencement of items herein specified.

1.06 FIELD MEASUREMENTS

A. Take field measurements at the site to verify or supplement indicated dimensions and to ensure proper coordination of all other construction items.

PART 2 PRODUCTS

2.01 MATERIALS

A. Topsoil shall be fertile, friable, loamy surface soil without admixture and free of stones, stumps, roots, sticks, debris, and clay balls greater than 1 inch in diameter. Topsoil shall be stripped from naturally well drained sites and be free of noxious weeds and other materials deleterious to plant growth. It shall have a pH range of 5.5 to 7.5 and have a minimum organic content of six percent (6%).

B. Lime shall be agricultural grade ground limestone or approved equivalent, containing not less than 85% calcium and magnesium carbonates.

C. Fertilizer shall be a commercial grade, 10-20-10 (N-P_2O_5-K_2O), uniform in composition, suitable for application with mechanical equipment, and conforming to Arkansas fertilizer laws. Deliver fertilizer to the site in original, unopened containers, bearing the name, trademark and manufacturer's guaranteed analysis. Store fertilizer so that it remains dry and free flowing.

D. Sod for Lawn Areas:

1. Unless otherwise noted on the Drawings, sod shall consist of Bermuda grass, grown by an established sod grower, and approved by the Owner.

2. Sod shall be vigorous, well-rooted, healthy turf; free from insect pests, disease, weeds, other grasses, stones, bare spots, burned spots, and any other harmful or deleterious matter. Sod shall be machine stripped at a uniform soil thickness of approximately 1 inch and not less than 3/4 inch. The thickness measurement shall not include top growth and thatch.

3. Sod shall not be harvested or transplanted when moisture content (excessively wet or dry) may adversely affect its survival.

4. Harvest, deliver and transplant sod within a 36-hour period unless a suitable preservation method is approved by the Engineer prior to delivery. Sod not transplanted with this period shall be subject to inspection and possible rejection by the Engineer prior to its installation.

PART 3 EXECUTION

3.01 GENERAL

A. Sodding shall consist of furnishing and applying topsoil, fertilizer, lime, sod, and water on all areas that have been disturbed by the construction work. These areas shall include lawns, pastures, ditches, ditch banks, embankment areas, compacted fill areas, cut or fill slopes and any area disturbed by construction.

B. Perform soil conditioning and sodding only during those periods within the season that are normal for such work as determined by the weather and locally accepted practice, as approved by the Engineer.

C. Submit schedules for sodding to the Engineer for approval prior to the work.

3.02 SODDING PREPARATION

A. Remove all excess dirt, construction materials, trees, rubbish, debris, roots, stumps, and rocks larger than 2 inches and dispose of off-site. Dress areas to be sodded to the lines and grades shown on the plans, and rake to loosen the subgrade immediately prior to the application of topsoil. Subgrade shall be inspected and approved by the Engineer before topsoil is placed.

B. Obtain soil samples, to a depth of 5 inches, from each major soil area, and have lime and fertilizer requirement analyses conducted.

C. Prepare subgrade by tilling prior to topsoil placement to obtain a satisfactory bond between the two (2) layers. Tillage operations shall be across slope but shall not take place on slopes steeper than 2:1 (horizontal to vertical) or where tillage equipment cannot be operated safely. Accomplish tillage by discing or harrowing to a depth of 9 inches parallel to contours. Do not perform tillage when the subgrade is frozen, excessively wet, extremely dry, or under other conditions that will not permit acceptable results. Rake the subgrade, or otherwise loosen the surface, immediately prior to application of topsoil.

D. Unless otherwise shown on the Drawings, place topsoil to a minimum depth of 4 inches on all parts of the site not covered with structures, pavement, or existing vegetation. Place topsoil over approved areas to a depth sufficiently greater than required so that after natural settlement and light rolling, the complete work will conform to the lines, grades and elevations shown on the Drawings or as directed by the Engineer. Do not handle, move, or spread topsoil when it is frozen or muddy.

E. After spreading topsoil, prepare it by scarifying or harrowing and hand raking. Remove all stiff clods, lumps, roots, litter, rocks, and other foreign material from the prepared area and dispose of it in an approved manner.

3.03 APPLICATION OF TOPSOIL AMENDMENTS

A. Lime

1. Apply lime at the rate determined by the lime requirement test to bring topsoil pH to a range of 5.5 to 7.5.

2. Uniformly spread lime and then thoroughly pulverize the surface by means of disk harrows, hand raking, or other approved methods, thoroughly mixing lime and soil to a depth of 4 inches. Remove rocks, large clods, lumps, brush, roots, litter, and other objectionable foreign matter turned up during mixing, and apply water to maintain the desired moisture content in the soil.

B. Fertilizing

1. Apply fertilizer at a rate determined by the soil test and as recommended by the sod supplier.

2. Apply fertilizer uniformly and incorporate it into the soil to a depth of at least 2 inches. Fertilizer may be applied hydraulically; however, the Contractor is responsible for cleaning all structures and paved areas of unwanted deposits.

3. Roll the prepared surface with a hand roller weighing not more than 100 lb/ft. of roller width. Refill with additional topsoil, regrade all depressions caused by settlement during rolling, and reroll until smooth.

4. If sod cannot be installed immediately, install temporary seeding and mulching in areas that will remain disturbed for more than two (2) weeks in accordance with Section 02370, Erosion and Sedimentation Control. Temporary seeding and mulching shall be considered incidental to the Work.

3.04 INSTALLATION OF SOD

A. Perform soil conditioning and sodding only during those periods within the season that are normal for such work as determined by the weather, locally accepted practices, and as approved by the Engineer. No sod shall be placed prior to the Engineer's inspection and approval of the prepared topsoil.

B. Perform sodding between the period of June 1 and September 1 and only if irrigation is provided, unless otherwise directed by the Engineer. For any sod applied after September 1, the Contractor shall provide an 18-month warranty on the sodding work from the date of installation.

C. Perform sodding within five (5) days following soil preparation.

D. Lightly moisten the soil immediately prior to laying the sod. Lay the first row of sod in a straight line with subsequent rows placed parallel to each other, staggering lateral joints. Exercise care to ensure that sod is not stretched or overlapped and that all joints are butted tightly to prevent voids. At the top of slopes, the sod shall be turned into the embankment slightly and a compacted layer of soil placed over it to conduct surface water over and onto the sod.

E. As sodding is completed in any one section, roll the area by making four (4) passes with a hand roller weighing not more than 100 lb/ft. of width.

F. Sod placed on slopes steeper than 3:1 (horizontal to vertical) shall be secured in place with wooden pegs or other approved devices driven through the sod into firm soil.

G. When noted on the Drawings, the Contractor shall overseed the sodding with annual rye seed applied at a rate of 6 to 10 lb/1,000ft^2.

H. Water sod immediately after transplanting to prevent excessive drying during the progress of the Work. After rolling, water the sod to a sufficient depth so that the underside of the new sod pad and soil immediately beneath are thoroughly wet. The Contractor is responsible for providing water and having an adequate supply available at the site during and after transplanting the sod. Always keep sodded areas moist. In the absence of adequate rainfall, water daily or as often as necessary to maintain soil moisture to a depth of 4 inches.

I. EROSION CONTROL

A. Install sodding as soon as construction work is completed to prevent unnecessary erosion of newly restored work areas and silting of drainage ways. If sod cannot be installed with five (5) days of topsoil preparation, install temporary seeding and mulching.

J. When newly graded subgrade areas cannot be topsoiled and sodded because of season or weather conditions, and when they will remain exposed for more than 14 days, protect those areas against erosion and washouts by temporary seeding and mulching. Prior to application of topsoil, thoroughly incorporate any such erosion control material into the subgrade by discing. Apply fertilizer prior to spreading of topsoil.

K. Provide protection of slopes against washouts by an approved method in accordance with Section 02370, Erosion and Sedimentation Control. Regrade and resod all washouts that occur until a good sod is established at no additional cost to the Owner.

3.05 CLEANUP

A. Prior to final acceptance and payment, the Contractor shall remove all machinery, equipment, surplus materials, rubbish, etc., from the project. Clean pavements, driveways, sidewalks, and storm drainage facilities, and remove surplus soil and debris.

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SECTION 03100

CONCRETE FORMWORK

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment, and incidentals required to design, install, adjust, and remove formwork for cast-in-place concrete as shown on the Drawings and as specified herein.

B. Secure to forms as required or set for embedment as required, all miscellaneous metal items, sleeves, reglets, anchor bolts, inserts, and other items furnished under other Sections and required to be cast into concrete. Items to be embedded in concrete shall be free from oil or any matter that decrease the bond between the concrete and these items.

1.02 MATERIALS COMPLIANCE WITH AIS

A. P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), includes an “American Iron and Steel (AIS)” requirement in section 436 that requires Clean Water State Revolving Loan Fund (CWSRF) and Drinking Water State Revolving Loan Fund (DWSRF) assistance recipients to use iron and steel products that are produced in the United States for projects for the construction, alteration, maintenance, or repair of a public water system or treatment works. This Project meets the definition of such work, and the Environment Protection Agency (EPA) implementation requirements for this AIS requirement are outlined within the DWSRF memorandum titled “Implementation of American Iron and Steel provisions of P.L. 113-76, Consolidated Appropriations Act, 2014” included as part of the RLF Supplemental General Conditions.

B. All parties are required to comply with these requirements and to ensure that all qualifying iron and steel products used in this project must be produced in the United States. See RLF Supplemental General Conditions for additional details.

1.03 RELATED SECTIONS

A. Section 01300 – Submittals

B. Section 03200 – Concrete Reinforcement

C. Section 03250 – Concrete Joints and Joint Accessories

D. Section 03300 – Cast-in-Place Concrete

E. Section 03600 – Grout

F. Section 03740 – Modification or Repair of Existing Concrete

1.04 REFERENCE STANDARDS

A. American Concrete Institute (ACI), latest edition:

1. ACI 301 Specifications for Structural Concrete

2. ACI 318 Building Code Requirements for Structural Concrete and Commentary

3. ACI 347 Guide to Formwork for Concrete

4. ACI 350 Code Requirements for Environmental Engineering Concrete Structures and Commentary

B. American Plywood Association (APA), latest edition:

1. Material grades and designations as specified

1.05 SYSTEM DESCRIPTION

A. General: Architectural Concrete is wall, slab, beam or column concrete which will have surfaces exposed to view in the finished work. It includes similar exposed surfaces in water containment structures from the top of walls to 2 feet below the normal water surface in open tanks and basins.

B. Structural design responsibility: The Contractor shall be responsible for the design and erection of all formwork in accordance with the requirements of ACI 301 and ACI 318. The formwork shall be designed for the loads, lateral pressures, and allowable stresses in conformance with ACI 347, Guide to Formwork for Concrete and shall comply with all applicable regulations and codes. The design shall consider any special requirements due to the use of plasticized and/or retarded set concrete.

1.06 SUBMITTALS

A. See Section 01300, Submittals for submittal procedures. Submit shop drawings and product data, showing materials of construction and details of installation for:

1. Form release agent

2. Form ties

3. Location and sequence of the concrete placements. Indicate locations of form joints, panel sizes, and patterns. Show location of form ties on architectural surfaces

4. Review of pour sequence, form system, and panel layout shall be for appearance and strength of the completed structure only. Review by the Engineer of forming plans or procedures shall not relieve the Contractor of responsibility for the strength, safety, or correctness of methods used, the adequacy of equipment, or from carrying out the Work in full compliance with the requirements of the Drawings and Specifications

B. Samples

1. The Contractor may be required by the Engineer to demonstrate that the form release agent will not adversely affect concrete surfaces to be painted, coated, or otherwise finished and will not affect the forming materials. The demonstration will be on a designated area of the concrete substructure exterior surface as directed by the Engineer.

PART 2 PRODUCTS

2.01 GENERAL

A. The usage of a manufacturer's name and model or catalog number is for the purpose of establishing the standard of quality and general configurations desired.

2.02 MATERIALS

A. Forms for cast-in-place concrete shall be made of wood, metal, or other approved material. Wood forms for the Project shall be new and unused. Construct wood forms of sound lumber or plywood of suitable dimensions and free from knotholes and loose knots. Where used for exposed surfaces, dress and match boards. Sand plywood smooth and fit adjacent panels with tight joints. Metal forms, using smooth metal plates free of surface irregularities, may be used when approved by the Engineer and shall be of an appropriate type for the class of work involved. All forms shall be designed and constructed to provide a flat, uniform concrete surface requiring minimal finishing or repairs.

B. Wall Forms

1. Forms for all exposed exterior and interior concrete walls shall be new and unused "Plyform" exterior grade plywood panels manufactured in compliance with the APA and bearing the trademark of that group or approved equal acceptable to the Engineer. Provide B grade or better veneer on all faces to be placed against concrete during forming. The class of material and grades or interior plies shall be of sufficient strength and stiffness to provide a flat, uniform concrete surface requiring minimal finishing and grinding.

2. Construct forms tight enough to prevent loss of concrete mortar.

C. Column Forms

1. Rectangular columns shall be formed as specified for wall forms. All corners shall have a 3/4-inch chamfer unless otherwise noted on the Drawings.

2. Circular columns shall be formed with steel, fiberglass reinforced plastic, or seamless cardboard column forms. The forms shall be continuous for the height of the column between construction joints indicated on the Drawings unless otherwise approved by the Engineer.

D. Rustications shall be at the location and shall conform to the details shown on the Drawings. Moldings for chamfers and rustications shall be milled and planed smooth. Rustications and corner strips shall be of a non-absorbent material, compatible with the form surface and fully sealed on all sides to prohibit the loss of paste or water between the two surfaces.

E. Form Release Agent

1. Coat all forming surfaces in contact with concrete using an effective, non-standing, non-residual, water based, bond-breaking form coating unless otherwise noted.

2. Do not allow form release agent to puddle in the forms.

3. Do not allow form release agent to contact reinforcing steel, embedded items, waterstop, or hardened concrete against which fresh concrete is to be placed.

F. Concrete surfaces which are to be painted shall be formed with hard plastic finished plywood or a similar material which does not require a form release agent unless the Contractor can substantiate to the satisfaction of the Engineer that the form release agent will not remain on the formed surface after it is stripped.

G. Forms for Architectural Concrete or Concrete Receiving Architectural Finish

1. Forms for architectural concrete shall be constructed of materials and in a manner that will result in rigid forms with sufficient strength to withstand, without noticeable deflection, movement, or leakage, the high hydraulic pressures resulting from rapid filling of the forms and heavy high frequency vibration of the concrete. Deflection in formwork shall be limited to 1/360 of each component span. Form joints shall be laid out in a uniform pattern or as indicated on the Drawings

H. Form Ties

1. Form ties encased in concrete other than those specified in the following paragraphs shall be designed so that, after removal of the projecting part, no metal shall remain within 1½ inches of the face of the concrete. The part of the tie to be removed shall be at least 1/2-inch diameter and 1½ inches long. Form ties in concrete exposed to view shall be the cone-washer type.

2. Form ties for exposed exterior and interior walls shall be as specified in the preceding paragraph except that the cones shall be of approved wood or plastic.

3. Flat bar ties for panel forms shall have plastic or rubber inserts having a minimum depth of 1½ inches and sufficient dimensions to permit proper patching of the tie hole.

4. Ties for liquid containment structures shall have an integral waterstop that is tightly welded to the tie, or a tight-fitting neoprene waterstop at mid-point, so that the waterstop cannot be moved from the midpoint area of the form tie.

5. Common wire shall not be used for form ties.

PART 3 EXECUTION

3.01 GENERAL

A. Forms shall be used for all cast-in-place concrete including sides of footings. Forms shall be constructed and placed so that the resulting concrete will be of the shape, lines, dimensions, and appearance indicated on the Drawings. Forms shall be sufficiently tight to prevent loss of mortar.

B. Forms for walls shall have removable panels at the bottom for cleaning, inspection and joint surface preparation. Forms for walls of considerable height shall have closable intermediate inspection ports. Tremies and hoppers for placing concrete shall be used to allow concrete inspection, prevent segregation and prevent the accumulation of hardened concrete on the forms above the fresh concrete.

C. Molding, bevels, or other types of chamfer strips shall be placed to produce blockouts, rustications, or chamfers as shown on the Drawings or as specified. Chamfer strips shall be provided at horizontal and vertical projecting corners to produce a 3/4-inch chamfer. Rectangular or trapezoidal moldings shall be placed in locations requiring sealant where specified or shown on the Drawings. Sizes of moldings shall conform to the sealant manufacturer's recommendations.

D. Forms shall be sufficiently rigid to withstand construction loads and vibration and to prevent displacement or sagging between supports. Construct forms so that the concrete will not be damaged by their removal. The Contractor shall be entirely responsible for the adequacy of the forming system.

E. Before form material is re-used, all surfaces to be in contact with concrete shall be thoroughly cleaned, all damaged places repaired, all projecting nails withdrawn, and all protrusions smoothed. Reuse of wooden forms for other than rough finish will be permitted only if a "like new" condition of the form is maintained.

3.02 FORM TOLERANCES

A. Forms shall be surfaced, designed and constructed in accordance with the recommendations of ACI 347 and shall meet the following additional requirements for the specified finishes.

B. Formed Surface Exposed to View: Edges of all form panels in contact with concrete shall be flush within 1/8 inch and forms for plane surfaces shall be such that the concrete will be plane within 1/8 inch in 5 feet. Forms shall be tight to prevent the passage of mortar, water and grout. The maximum deviation of the finish wall surface at any point shall not exceed 1/4 inch from the intended surface as shown on the Drawings. Form panels shall be arranged symmetrically and in an orderly manner to minimize the number of seams.

C. Formed surfaces not exposed to view or buried shall meet requirements of Class "C" Surface in ACI 347. Limit abrupt or gradual irregularities in formed surfaces not exposed to view to ½ inch within a 5-foot length as measured with a straightedge.

D. Formed rough surfaces including mass concrete pipe encasement, electrical duct encasement, and other similar installations shall have no minimum requirements for surface smoothness and surface deflections. The overall dimensions of the concrete shall be plus or minus 1 inch.

E. Formed Concrete Surfaces to Receive Paint: Surface deflections shall be limited to 1/32 inch at any point and the variation in wall deflection shall not exceed 1/16-inch per 4 feet. The maximum deviation of the finish wall surface at any point shall not exceed 1/4 inch from the intended surface as shown on the Drawings.

F. Architectural Concrete: All smooth faces to be exposed to view shall have surface deflections limited to 1/32 inch at any point and the variation in wall deflection shall not exceed 1/16 inch per 4 feet. The maximum deviation of the finished wall surface at any point shall not exceed 1/4 inch from the intended surface as shown on the Drawings. All textured faces, form lines, or rustications to be exposed to view shall be straight, plumb, and true with a variation of no more than 1/4 inch in 10 feet measured in any direction.

3.03 FORM PREPARATION

A. Wood forms in contact with the concrete shall be coated with an effective release agent prior to form installation.

B. Steel forms shall be thoroughly cleaned, and mill scale and other ferrous deposits shall be sandblasted or otherwise removed from the contact surface for all forms, except those utilized for surfaces receiving a rough finish. All forms shall have the contact surfaces coated with a release agent.

3.04 REMOVAL OF FORMS

A. The Contractor shall be responsible for all damage resulting from removal of forms. Forms and shoring for structural slabs or beams shall remain in place in accordance with ACI 301 and ACI 347. Form removal shall conform to the requirements specified in Section 03300, Cast-in-Place Concrete.

3.05 INSPECTION

A. The Engineer shall be notified when the forms are complete and ready for inspection at least six hours prior to the proposed concrete placement.

B. Failure of the forms to comply with the requirements specified herein, or to produce concrete complying with requirements of these Specifications, shall be grounds for rejection of that portion of the concrete work. Rejected work shall be repaired or replaced as directed by the Engineer at no additional cost to the Owner. Such repair or replacement shall be subject to the requirements of these Specifications and approval of the Engineer.

END OF SECTION

SECTION 03200

CONCRETE REINFORCEMENT

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment, and incidentals required and install all concrete reinforcement complete as shown on the Drawings and as specified herein.

B. Furnish all the deformed steel reinforcement required to be entirely built into the concrete masonry unit construction.

1.02 MATERIALS COMPLIANCE WITH AIS

A. P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), includes an “American Iron and Steel (AIS)” requirement in section 436 that requires Clean Water State Revolving Loan Fund (CWSRF) and Drinking Water State Revolving Loan Fund (DWSRF) assistance recipients to use iron and steel products that are produced in the United States for projects for the construction, alteration, maintenance, or repair of a public water system or treatment works. This Project meets the definition of such work, and the Environment Protection Agency (EPA) implementation requirements for this AIS requirement are outlined within the DWSRF memorandum titled “Implementation of American Iron and Steel provisions of P.L. 113-76, Consolidated Appropriations Act, 2014” included as part of the RLF Supplemental General Conditions.

B. All parties are required to comply with these requirements and to ensure that all qualifying iron and steel products used in this project must be produced in the United States. See RLF Supplemental General Conditions for additional details.

1.03 RELATED SECTIONS

A. Section 01300 - Submittals

B. Section 03100 – Concrete Formwork

C. Section 03250 – Concrete Joint and Joint Accessories

D. Section 03300 – Cast-in-Place Concrete

E. Section 03600 – Grout

F. Section 03740 – Modification or Repair of Existing Concrete

G. Section 04200 – Masonry

1.04 REFERENCE STANDARDS

A. ASTM International (ASTM), latest edition:

1. ASTM A36 Standard Specification for Carbon Structural Steel
2. ASTM A615 Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
3. ASTM A706 Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement
4. ASTM A722 Standard Specification for High-Strength Steel Bars for Prestressed Concrete
5. ASTM A934 Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars
6. ASTM A1064 Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
7. ASTM C1116 Standard Specification for Fiber-Reinforced Concrete
8. ASTM F3125 Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions

B. American Concrete Institute (ACI), latest edition:

1. ACI 301 Specifications for Structural Concrete and Commentary
2. ACI 318 Building Code Requirements for Structural Concrete and Commentary
3. ACI 350 Code Requirements for Environmental Engineering Concrete Structures and Commentary
4. SP-66 ACI Detailing Manual

C. Concrete Reinforcing Steel Institute (CRSI), latest edition:

1. Manual of Standard Practice

D. American Welding Society (AWS), latest edition:

1. AWS D1.4 Structural Welding Code–Reinforcing Steel

1.05 SUBMITTALS

A. See Section 01300, Submittals for submittal procedures. Submit shop drawings and product data showing materials of construction and details of installation for:

1. Reinforcing steel: Placement drawings shall conform to the recommendations of ACI 301 and SP-66 ACI Detailing Manual. All reinforcement in a concrete placement shall be included on a single placement drawing or cross-referenced to the main pertinent placement drawing. This drawing shall include the additional reinforcement (around openings, at corners, etc.) shown on the standard detail sheets. Bars to have special coatings or to be of special steel or special yield strength are to be clearly identified.

2. Bar bending details: The bars shall be referenced to the same identification marks shown on the placement drawings. Bars to have special coatings or to be of special steel or special yield strength are to be clearly identified.

3. Schedule of all placements to contain synthetic reinforcing fibers. The amount of fibers per cubic yard to be used for each of the placements shall be noted on the schedule. The name of the manufacturer of the fibers and the product data shall be included with the submittal.

4. Reinforcing bar supports and accessories.

B. Submit samples of each of the following items.

1. One (1) sample of each type of mechanical reinforcing steel connectors, if used.

C. Furnish test data to indicate compliance with the following:

1. Certified copy of mill test on each steel proposed for use showing the physical properties of the steel and the chemical analysis

2. Certified copy of test reports for each foreign manufactured steel proposed for use in the fabrication of reinforcement. The tests shall be specifically made for this project at the expense of the Contractor by a domestic independent testing laboratory certified to perform the tests. The testing shall be for conformity to the applicable ASTM standard

3. Welder's certification. The certification shall be in accordance with AWS D1.4 when welding of reinforcement is required

1.06 QUALITY ASSURANCE

A. Provide services of a manufacturer's representative having at least two (2) years' experience in the use of the reinforcing fibers for a preconstruction meeting and assistance during the first placement of the material.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Reinforcing steel shall be substantially free from mill scale, rust, dirt, grease, or other foreign matter.

B. Reinforcing steel shall be shipped and stored with bars of the same size and shape fastened in bundles with durable tags, marked in a legible manner with waterproof markings showing the same "mark" designations as those shown on the submitted Placing Drawings.

C. Reinforcing steel shall be stored off the ground, protected from moisture and kept free from dirt, oil, or other injurious contaminants.

PART 2 PRODUCTS

2.01 MATERIALS

A. Materials shall be new and shall comply with the following material specifications

B. Deformed Concrete Reinforcing Bars: ASTM A615, Grade 60 deformed bars

C. Concrete Reinforcing Bars required on the Drawings to be field bent or welded: ASTM A706

D. Spiral Reinforcement

1. ASTM A615, Grade 60 for hot-rolled plain or deformed bars

2. ASTM A1064 for cold-drawn wire

E. Welded Steel Wire Fabric: ASTM A1064

F. The following alternate materials are allowed:

1. ASTM A615 Grade 60 may be used for ASTM A706 provided the following requirements are satisfied:

a. The actual yield strength of the reinforcing steel based on mill test shall not exceed the specified yield strength by more than 18,000 psi. Retests shall not exceed this value by more than an additional 3,000 psi.

b. The ratio of the actual ultimate tensile strength to the actual tensile yield strength of the reinforcement shall not be less than 1.25.

c. The carbon equivalency (CE) of ASTM A615 bars shall be 0.55 or less.

G. Prestressing strand for precast prestressed concrete is specified in Section 03420, Precast and Precast Prestressed Concrete.

H. High strength uplift anchor rods used in auger cast piles shall be the diameter and the full pile length as shown on the Drawings. The rods shall be hot rolled and proof stressed, high strength alloy steel conforming to ASTM A722, Type II with surface deformations having a single minimum ultimate tensile strength level of 15,000 psi. The bars shall be "Dywidag Threadbar System" manufactured by Dyckerhoff and Widman, Inc., San Diego, California, or approved equal acceptable to Engineer. Each uplift anchor shall have an anchor plate (ASTM A36), bevel washer (ASTM A325) and hex unit (ASTM A325) as shown on the Drawings and recommended by the manufacturer to carry the specified uplift loading.

I. Reinforcing Steel Accessories

1. Plastic Protected Bar Supports: CRSI Bar Support Specifications Class 1-Maximum Protection.

2. Stainless Steel Protected Bar Supports: CRSI Bar Support Specifications, Class 2-Moderate Protection

3. Precast Concrete Block Bar Supports: CRSI Bar Support Specifications, Precast Blocks. Blocks shall have equal or greater strength than the surrounding concrete.

J. Tie Wire

1. Tie Wired for Reinforcement shall be 16-gauge or heavier, black annealed wire.

K. Mechanical reinforcing steel butt splices shall be positive connecting threaded type couplers such as Lenton rebar splices by Erico Products, Inc.; MRC Couplers by Dayton Superior, or approved equal. They shall meet all ACI 318 Building Code requirements. Bar couplers shall be torqued to manufacturer's recommended value.

1. Unless otherwise noted on the Drawings, mechanical tension splices shall be designed to produce a splice strength in tension or compression of not less than 125 percent (125%) of the ASTM specified minimum yield strength of the rebar in pounds based on the gross area of the rebar.

2. Compression type mechanical splices shall provide concentric bearing from one bar to the other bar and shall be capable of developing the ultimate strength of the rebar in compression.

L. Fiber Reinforcement (Fiber mesh): Synthetic reinforcing fiber must meet the requirements of ASTM C1116. Synthetic reinforcing fiber for concrete shall be 100 percent (100%) polypropylene collated, fibrillated fibers as manufactured by Propex Concrete Systems Corp., Chattanooga, Tennessee, or approved equal. Fiber length and quantity for the concrete mix shall be in strict compliance with the manufacturer's recommendations as approved by the Engineer.

M. Epoxy-Coated Reinforcing Steel: shall be provided at locations specified on the Drawings. Epoxy-coated bars shall conform to ASTM A934.

2.02 FABRICATION

A. Fabrication of reinforcement shall be in compliance with the CRSI Manual of Standard Practice.

B. Bars shall be cold bent. Bars shall not be straightened or re-bent.

C. Bars shall be bent around a revolving collar having a diameter of not less than that recommended by the CRSI.

D. Bar ends that are to be butt spliced, placed through limited diameter holes in metal, or threaded, shall have the applicable end(s) saw-cut. Such ends shall terminate in flat surfaces within 1-1/2 degrees (1.5°) of a right angle to the axis of the bar.

E. Spirals (may be substituted for non-spiral ties in circular columns)

1. Provide a minimum of one and one-half (1-1/2) finishing turns at the top and bottom.

2. Splices shall be tension lap splices at least 48 bar diameters, but not less than 12 inches in length. Welded splices shall only be used where specifically approved by the Engineer.

3. Provide spacers as recommended by the CRSI.

PART 3 EXECUTION

3.01 INSTALLATION

A. Surface condition, bending, spacing and tolerances of placement of reinforcement shall comply with the CRSI Manual of Standard Practice. The Contractor shall be solely responsible for providing an adequate number of bars and maintaining the spacing and clearances shown on the Drawings.

B. Except as otherwise indicated on the Drawings, the minimum concrete cover of reinforcement shall be as follows:

1. Concrete cast against and permanently exposed to earth: 3 inches
2. Concrete exposed to soil, water, sludge, or weather: 2 inches
3. Concrete not exposed to soil, water, sludge, or weather: 1-1/2 inches

C. Reinforcement which will be exposed for a considerable length of time after being placed shall be coated with a heavy coat of neat cement slurry.

D. No reinforcing steel bars shall be welded either during fabrication or erection unless specifically shown on the Drawings or specified, or unless prior written approval has been obtained from the Engineer. All bars that have been welded, including tack welds, without such approval shall be immediately removed from the work. When welding of reinforcement is approved, or called for, it shall comply with AWS D1.4.

E. Reinforcing steel interfering with the location of other reinforcing steel, conduits, or embedded items, may be moved within the specified tolerances or one (1) bar diameter, whichever is greater. Greater displacement of bars to avoid interference shall only be made with the approval of the Engineer. Do not cut reinforcement to install inserts, conduits, mechanical openings, or other items without the prior approval of the Engineer.

F. Securely support and tie reinforcing steel to prevent movement during concrete placement. Secure dowels in place before placing concrete.

G. Securely tie reinforcement steel at each intersection (100 percent) for all reinforcement steel splice locations, and at every third intersection (33 percent) otherwise. Two (2) ties are required at each tie location.

H. Reinforcing steel bars shall not be field bent except where shown on the Drawings or specifically authorized in writing by the Engineer. If authorized, bars shall be cold bent around the standard diameter spool specified in the CRSI. Do not heat bars. Closely inspect the reinforcing steel for breaks. If the reinforcing steel is damaged, replace, Cadweld or otherwise repair as directed by the Engineer. Do not bend reinforcement after it is embedded in concrete unless specifically shown otherwise on the Drawings.

3.02 REINFORCEMENT AROUND OPENINGS

A. Unless specific additional reinforcement around openings is shown on the Drawings, provide additional reinforcing steel on each side of the opening equivalent to one half of the cross-sectional area of the reinforcing steel interrupted by an opening. The bars shall have sufficient length to develop bond at each end beyond the opening or penetration.

3.03 SPLICING OF REINFORCEMENT

A. Splices designated as compression splices on the Drawings, unless otherwise noted, shall be 30 bar diameters, but not less than 12 inches. The lap splice length for column vertical bars shall be based on the bar size in the column above.

B. Tension lap splices shall be provided at all laps in compliance with ACI 318/ACI 350 and as detailed on the Drawings. Class A splices may be used when 50 percent (50%) or less of the bars are spliced within the required lap length. Class B splices shall be used at all other locations.

C. Splicing of reinforcing steel in concrete elements noted to be "tension members" on the Drawings shall be avoided whenever possible. However, if required for constructability, splices in the reinforcement subject to direct tension shall be welded to develop, in tension, at least 125 percent (125%) of the specified yield strength of the bar. Splices in adjacent bars shall be offset the distance of a Class C splice.

D. Install wire fabric in as long lengths as practicable. Splices in welded wire fabric shall be lapped in accordance with the requirements of ACI 318 but not less than 12 inches. The spliced fabrics shall be tied together with wire ties spaced not more than 24 inches on center and laced with wire of the same diameter as the welded wire fabric. Do not position laps midway between supporting beams, or directly over beams of continuous structures. Offset splices in adjacent widths to prevent continuous splices.

E. Mechanical reinforcing steel splicers shall be used only where shown on the Drawings. Splices in adjacent bars shall be offset by at least 30 bar diameters. Mechanical reinforcing splices are only to be used for special splice and dowel conditions approved by the Engineer.

3.04 SHRINKAGE AND TEMPERATURE REINFORCEMENT

A. Shrinkage and temperature reinforcement shall be provided as indicated on the Drawings. Shrinkage and temperature reinforcing bars should be placed at right angles to structural steel for all structural slabs, unless otherwise specified.

3.05 ACCESSORIES

A. The Contractor shall be solely responsible for determining, providing and installing accessories such as chairs, chair bars and the like in sufficient quantities and strength to adequately support the reinforcement and prevent its displacement during the erection of the reinforcement and the placement of concrete.

B. Use precast concrete blocks where the reinforcing steel is to be supported over soil.

C. Stainless steel bar supports, steel chairs with stainless steel tips, or plastic bar supports shall be used where the chairs are set on forms for a concrete surface that will be exposed to weather, high humidity, or liquid (including bottom of slabs over liquid containing areas). Use of galvanized or plastic tipped metal chairs is permissible in all other locations unless otherwise noted on the Drawings or specified.

D. Alternate methods of supporting top steel in slabs, such as steel channels supported on the bottom steel or vertical reinforcing steel fastened to the bottom and top mats, may be used if approved by the Engineer.

3.06 INSPECTION

A. In no case shall any reinforcing steel be covered with concrete until the installation of the reinforcement, including size, spacing and position of the reinforcement has been observed by the Engineer and the Engineer's release to proceed with the concreting has been obtained. The Engineer shall be given ample prior notice of the readiness of placed reinforcement for observation. The forms shall be kept open until the Engineer has finished his/her observations of the reinforcing steel.

END OF SECTION

SECTION 03250

CONCRETE JOINTS AND JOINT ACCESSORIES

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment, and incidentals required and install accessories for concrete joints as shown on the Drawings and as specified herein.

1.02 MATERIALS COMPLIANCE WITH AIS

A. P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), includes an “American Iron and Steel (AIS)” requirement in section 436 that requires Clean Water State Revolving Loan Fund (CWSRF) and Drinking Water State Revolving Loan Fund (DWSRF) assistance recipients to use iron and steel products that are produced in the United States for projects for the construction, alteration, maintenance, or repair of a public water system or treatment works. This Project meets the definition of such work, and the Environment Protection Agency (EPA) implementation requirements for this AIS requirement are outlined within the DWSRF memorandum titled “Implementation of American Iron and Steel provisions of P.L. 113-76, Consolidated Appropriations Act, 2014” included as part of the RLF Supplemental General Conditions.

B. All parties are required to comply with these requirements and to ensure that all qualifying iron and steel products used in this project must be produced in the United States. See RLF Supplemental General Conditions for additional details.

1.03 RELATED SECTIONS

A. Section 01300 – Submittals

B. Section 03100 – Concrete Formwork

C. Section 03200 – Concrete Reinforcement

D. Section 03250 – Cast-in-Place Concrete

E. Section 03350 – Concrete Finishes

F. Section 03740 – Modification or Repair of Existing Concrete

G. Section 03600 – Grout

H. Section 05500 – Miscellaneous Metal

1.04 REFERENCE STANDARDS

A. ASTM International (ASTM), latest edition:

1. ASTM C1059 Standard Specifications for Latex Agents for Bonding Fresh to Hardened Concrete

2. ASTM D1751 Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Asphalt Types)

3. ASTM D1752 Standard Specification for Preformed Sponge Rubber, Cork, and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction

1.05 SUBMITTALS

A. See Section 01300, Submittals for submittal procedures. Shop drawings and product data shall include the following:

1. Waterstops: Product data including catalog cut, technical data, storage requirements, splicing methods, and conformity to ASTM standards.

2. Pre-molded joint fillers: Product data including catalog cut, technical data, storage requirements, installation requirements, location of use, and conformity to ASTM standards.

3. Bond breaker: Product data including catalog cut, technical data, storage requirements, installation requirements, location of use, and conformity to ASTM standards.

4. Compressible joint filler: Product data including catalog cut, technical data, storage requirements, installation requirements, location of use, and conformity to ASTM standards.

5. Bonding agents: Product data including catalog cut, technical data, storage requirements, product life, application requirements, and conformity to ASTM standards.

6. Expansion joint dowels: Product data including dowels, coatings, lubricants, expansion caps, installation requirements, and conformity to ASTM standards.

B. Certifications:

1. Certification that all materials used within the joint system are compatible with each other.

PART 2 PRODUCTS

2.01 GENERAL

A. The use of manufacturer's name and model or catalog number is for the purpose of establishing the standard of quality and general configuration.

B. All materials used together in a given joint (bond breaker, backer rods, joint fillers, sealants, etc.) shall be compatible with one another. Coordinate selection of supplies and products to ensure compatibility. Under no circumstances shall asphaltic bond breakers of joint fillers be used in joints receiving sealant.

2.02 MATERIALS

A. Waterstops

1. Plastic waterstop – Non-expansion joint in liquid retaining structure: 9 inches by 3/8 inch (9″ x 3/8″) ribbed type flat waterstops in base slabs and 6 inches by 3/8 inch (6″ x 3/8″) ribbed type flat waterstops otherwise. Plastic waterstop shall be made by extruding elastomeric plastic compound with polyvinylchloride as the basic resins. Minimum tensile strength of waterstops shall be 1,750 psi. Waterstops shall be style FR-9380 (9-inch) and FR-6380 (6-inch) by Paul Murphy Plastics Co., Roseville, Michigan; Style 646 (9-inch) and Style 679 (6-inch) by Greenstreak Plastic Products, St. Louis, Missouri; Style R938 (9-inch) and R638 (6-inch) by Vinylex Corp., Knoxville, Tennessee; or approved equal.

2. Pre-formed adhesive waterstops: The waterstops shall be a formulated compound of bentonite/butyl that swells upon contact with water. The waterstops shall be Waterstop RX 101 as manufactured by CETCO of Arlington Heights, Illinois, or approved equal. Primer for the material shall be as recommended by the waterstop manufacturer. Waterstop RX 102 shall be used in all locations where there is less than 3-inch concrete cover above pre-formed adhesive waterstop.

3. PVC Retrofit Waterstop - Non-expansion joints. The “T” type waterstop shall be made by extruding elastomeric plastic compound with virgin polyvinylchloride as the basic resins. The compound shall contain no reprocessed materials. Minimum tensile strength of waterstop shall be 1750 psi. The waterstop shall conform to CRD C572. Waterstop shall be Style 609 system, complete with Type 304 stainless steel batten bars and 1/4-in expansion bolts, by Greenstreak Plastic Products, St. Louis, MO or approved equal.

B. Pre-molded Joint Filler

1. Pre-molded joint filler – structures: Sponge Rubber, pre-molded joint filler shall conform to ASTM D1752 Type I. The thickness shall be 3/4 inch unless otherwise shown on the Drawings.

2. Pre-molded joint fillers – sidewalk and roadway concrete pavements or where fiber joint filler is specifically noted on the Drawings. The joint filler shall be asphalt-

impregnated fiber board conforming to ASTM D1751. Thickness shall be 3/4 inch unless otherwise shown on the Drawings.

C. Bond Breaker

1. Bond breaker tape shall be an adhesive-backed glazed butyl or polyethylene tape which will satisfactorily adhere to the pre-molded joint filler or concrete surface as required. The tape shall be the same width as the joint.

2. Bond breaker for concrete other than where tape is specifically called for shall be either bond breaker tape or a non-staining type bond prevention coating such as Williams Tilt-up Compound by Williams Distributors, Inc.; Silcoseal 77, by SCA Construction Supply Division, Superior Concrete Accessories; or approved equal.

D. Bonding Agent

1. Epoxy bonding agent shall be as specified in Section 03740, Modification or Repair of Existing Concrete.

PART 3 EXECUTION

3.01 INSTALLATION

A. Waterstops

1. Install waterstops for all joints where indicated on the Drawings. Waterstops shall be continuous around all corners and intersections so that a continuous seal is provided. Splices shall be made by welding in accordance with the manufacturer's recommendations, subject to acceptance of the Engineer. Only manufacturer's special approved tools shall be used for welding. The finished splices shall provide a cross-section that is dense and free of porosity.

2. Construct forms for construction joints in such a manner as to prevent damage to waterstops. Secure waterstops in wall joints before concrete is placed using tie wire and manufacturer’s hog rings, punched flanges, or grommets. The waterstop shall be centered in the joint so that the symmetrical halves of the waterstop are equally divided between the concrete pours at the joint. Tie both edges of the waterstop to reinforcing steel with black annealed steel tie wire as specified for tying reinforcing steel and secure in place so that the waterstop will be perpendicular to the joint and remain in the required position during concrete placement.

3. The spacing of the waterstop ties shall match the spacing of the adjacent reinforcing but need not be spaced closer than 12 inches on center.

4. Horizontal waterstops on slabs shall be clamped in position by the bulkhead (unless previously set in concrete) and the edge of the waterstops shall be lifted while placing concrete below the waterstop. Then the waterstop shall be manually forced against and into the placed concrete and covered with fresh concrete to ensure adequate encasement of the waterstop in concrete.

5. Each piece of the waterstop shall be of maximum practicable length to provide a minimum number of splices.

6. Care shall be exercised to ensure that the waterstops is completely embedded in void-free concrete.

7. Install pre-formed adhesive waterstops, including concrete surface preparation and application of primers, in accordance with the recommendations of the waterstop manufacturer.

8. PVC retrofit waterstops shall be fabricated, spliced, and located as specified for PVC standard waterstops. Existing concrete which is to receive the retrofit waterstop shall be cleaned of all foreign material and patched as necessary to form a smooth plane surface. Adhesives, fastening devices, and fastener spacing shall conform to the manufacturer's recommendations.

9. The Contractor shall take suitable precautions and means to support and protect the waterstops during the progress of the Work and shall repair or replace at Contractor's expense any waterstops damaged during the progress of the Work.

B. Construction Joints

1. General: Contractor shall submit for review and approval layout and sequencing of all concrete joints. Concrete joints shall be as indicated and in accordance with the following, unless indicated or noted otherwise:

   a. Provide horizontal construction joints at top of foundation members and slabs on grade and at the soffit of supported slabs and beams.

   b. Space the construction joints at a maximum horizontal distance of 40 feet and a maximum vertical distance of 16 feet.

   c. Space the corner vertical construction joints between 4 and 8 feet from the comer of walls or wall intersections.

   The Contractor may submit a request to deviate from these requirements with the concrete joint layout and sequencing submittal, but any such request will be subject to the review and approval of the Engineer.

2. Make construction joints only at locations shown on the Drawings or as approved by the Engineer. Any additional or relocation of construction joints proposed by the Contractor, must be submitted to the Engineer for written approval.

3. Additional or relocated joints should be located where they least impair strength of the member. In general, locate joints within the middle third of spans of slabs, beams and girders. However, if a beam intersects a girder at the joint, offset the joint a distance equal to twice the width of the member being connected. Locate the joints in walls and columns at the underside of floors, slabs, beams, or girders and at tops of footings or floor slabs. Do not locate joints between beams, girders, column capitals, or drop panels and the slabs above them. Do not locate joints between brackets or haunches and walls or columns supporting them.

4. All joints shall be perpendicular to main reinforcement. Continue reinforcing steel through the joints as indicated on the Drawings.

5. Provide sealant grooves for joint sealant where indicated on the Drawings.

6. At all construction joints and at concrete joints designated on the Drawings to be "roughened", uniformly roughen the surface of the concrete to a full amplitude (distance between high and low points or side to side) of approximately 1/4 inch with suitable tools to expose a fresh face. Thoroughly clean joint surfaces of loose or weakened materials by waterblasting or sandblasting and prepare for bonding.

7. In lieu of the above method for securing bond between new and set concrete, the following optional method may be used. Concrete must be allowed to set a minimum of 28 days. Use an epoxy bonding agent applied to roughened and cleaned surfaces of set concrete in strict accordance with manufacturer's recommendations and as specified in Section 03740 with respect to preparation of surfaces and applications of bonding agent.

8. Provide waterstops in all wall and slab construction joints in liquid containment structures and at other locations shown on the Drawings.

9. Keyways shall not be used in construction joints unless specifically shown on the Drawings or approved by the Engineer.

C. Control Joints

1. Provide sealant grooves, sealants and waterstops at control joints in slabs on grade and walls as detailed. Provide waterstops at all wall and slab control joints for water containment structures and at all other locations identified on the Drawings.

2. Control joints may be sawed if specifically approved by the Engineer. If control joint grooves are sawed, properly time the saw cutting with time of the concrete set. Start cutting as soon as concrete has hardened sufficiently to prevent aggregates from being dislodged by the saw. Complete cutting before shrinkage stresses have developed sufficiently to induce cracking. No reinforcing shall be cut during sawcutting.

3. Extend every other bar for reinforcing steel through control joints or as indicated on the Drawings. Where specifically noted on the Drawings, coat the concrete surface with a bond breaker prior to placing new concrete against it. Avoid coating reinforcement or waterstops with bond breaker at these locations.

END OF SECTION

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor and materials required and install cast-in-place concrete as shown on the Drawings and as specified herein.

1.02 MATERIALS COMPLIANCE WITH AIS

A. P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), includes an “American Iron and Steel (AIS)” requirement in section 436 that requires Clean Water State Revolving Loan Fund (CWSRF) and Drinking Water State Revolving Loan Fund (DWSRF) assistance recipients to use iron and steel products that are produced in the United States for projects for the construction, alteration, maintenance, or repair of a public water system or treatment works. This Project meets the definition of such work, and the Environment Protection Agency (EPA) implementation requirements for this AIS requirement are outlined within the DWSRF memorandum titled “Implementation of American Iron and Steel provisions of P.L. 113-76, Consolidated Appropriations Act, 2014” included as part of the RLF Supplemental General Conditions.

B. All parties are required to comply with these requirements and to ensure that all qualifying iron and steel products used in this project must be produced in the United States. See RLF Supplemental General Conditions for additional details.

1.03 RELATED SECTIONS

A. Section 01300 – Submittals

B. Section 01450 – Field Quality Control

C. Section 03100 – Concrete Formwork

D. Section 03200 – Concrete Reinforcement

E. Section 03250 – Concrete Joints and Joint Accessories

F. Section 03350 – Concrete Finishes

G. Section 03600 – Grout

H. Section 03740 – Modification or Repair of Existing Concrete

I. Division 07 – Thermal and Moisture Protection

1.04 REFERENCE STANDARDS

A. ASTM International (ASTM), latest edition:

1. ASTM C31 Standard Practice for Making and Curing Concrete Test Specimens in the Field
2. ASTM C33 Standard Specification for Concrete Aggregates
3. ASTM C39 Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
4. ASTM C42 Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
5. ASTM C94 Standard Specification for Ready-Mixed Concrete
6. ASTM C143 Standard Test Method for Slump of Hydraulic Cement Concrete
7. ASTM C150 Standard Specification for Portland Cement
8. ASTM C156 Standard Test Method for Water Loss [from a Mortar Specimen] Through Liquid Membrane-Forming Curing Compounds for Concrete
9. ASTM C171 Standard Specification for Sheet Materials for Curing Concrete
10. ASTM C172 Standard Practice for Sampling Freshly Mixed Concrete
11. ASTM C173 Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
12. ASTM C231 Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
13. ASTM C260 Standard Specification for Air-Entraining Admixtures for Concrete
14. ASTM C309 Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
15. ASTM C311 Standard Test Methods for Sampling and Testing Coal Ash or Natural Pozzolans for Use in Concrete
16. ASTM C330 Standard Specification for Lightweight Aggregates for Structural Concrete
17. ASTM C494 Standard Specification for Chemical Admixtures for Concrete
18. ASTM C567 Standard Test Method for Determining Density of Structural Lightweight Concrete
19. ASTM C595 Standard Specification for Blended Hydraulic Cements

20. ASTM C617 Standard Practice for Capping Cylindrical Concrete Specimens

21. ASTM C618 Standard Specification for Coal Ash and Raw or Calcined Natural Pozzolan for Use in Concrete

22. ASTM C881 Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete

23. ASTM C1231 Standard Practice for Use of Unbonded Caps in Determination of Compressive Strength of Hardened Cylindrical Concrete Specimens

24. ASTM C1602 Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete

25. ASTM C1611 Standard Test Method for Slump Flow of Self-Consolidating Concrete

26. ASTM E1745 Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs

B. American Concrete Institute (ACI), latest edition:

1. ACI 211.1 Selecting Proportions for Normal-Density and High Density-Concrete-Guide

2. ACI 301 Specifications for Concrete Construction

3. ACI 303R Guide to Cast-in-Place Architectural Concrete

4. ACI 304R Guide for Measuring, Mixing, Transporting, and Placing Concrete

5. ACI 304.2R Guide to Placing Concrete by Pumping Methods

6. ACI 305R Guide to Hot Weather Concreting

7. ACI 306R Guide to Cold Weather Concreting

8. ACI 308R Guide to External Curing of Concrete

9. ACI 309R Guide for Consolidation of Concrete

10. ACI 318 Building Code Requirements for Structural Concrete and Commentary

11. ACI 350 Code Requirements for Environmental Engineering Concrete Structures and Commentary

C. National Sanitation Foundation (NSF), latest edition:

1. NSF 61 Drinking Water System Components – Health Effects

1.05 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash; subject to compliance with specification requirements.

1.06 SUBMITTALS

A. See Section 01300, Submittals for submittal procedures. Shop drawings and product data shall include the following:

1. Concrete mix designs for all classes of concrete proposed for use on the project.

2. Concrete strength test results and mix design used from a record of past performance, or the laboratory trial mix designs and results, and the mix proposed for each mixture and use under this contract in accordance with ACI 301 Specifications for Concrete Construction.

3. Sources of cement, pozzolan, and aggregates.

4. Material Safety Data Sheets (MSDS) for all concrete components and admixtures.

5. Air-entraining admixture: Product data including catalog cut, technical data, storage requirements, product life, recommended dosage, temperature considerations, and conformity to ASTM standards.

6. Water reducing admixture: Product data including catalog cut, technical data, storage requirements, product life, recommended dosage, temperature considerations, and conformity to ASTM standards.

7. Mid-range water reducing admixture: Product data including catalog cut, technical data, storage requirements, product life, recommended dosage, temperature considerations, and conformity to ASTM standards.

8. High-range water reducing admixture (super-plasticizer): Product data including catalog cut, technical data, storage requirements, product life, recommended dosage, temperature considerations, retarding effect, slump range, and conformity to ASTM standards. Identify proposed locations of use.

9. Crystalline waterproofing admixture. Product data including catalog cut, technical data, manufacturer’s specifications, installation instructions, test reports, storage requirements, product life, recommended dosage, temperature considerations, retarding effect, manufacturer’s certification.

10. Retarding and Accelerating Admixtures: Product data including catalog cut, technical data, storage requirements, product life, recommended dosage, temperature considerations, and conformity to ASTM standards.

11. Sheet curing material: Product data including catalog cut, technical data, and conformity to ASTM standard.

12. Liquid curing compound: Product data including catalog cut, technical data, storage requirements, product life, application rate, and conformity to ASTM standards. Identify proposed locations of use.

B. Samples

1. Fine and coarse aggregates if requested for examination by the Engineer.

C. Furnish test data to indicate compliance with the following:

1. Sieve analysis, mechanical properties, and deleterious substance content for coarse and fine aggregate.

2. Chemical analysis and physical tests of each type of cement.

3. Chemical analysis and physical tests of pozzolan.

D. Certifications

1. Materials and admixtures in each class of concrete mix used in construction of liquid containing concrete structures in contact with in-process or treated drinking water shall be certified as being in compliance with ANSI/NSF Standard 61.

2. Certify admixtures used in the same concrete mix are compatible with each other and the aggregates.

3. The ready-mix supplier shall be approved in writing by the crystalline waterproofing manufacturer or manufacturer's representative.

E. Qualifications

1. Independent testing laboratory: Name, address, and qualifications. Laboratories affiliated with the Contractor or in which the Contractor or its officers have a beneficial interest are not acceptable.

1.07 QUALITY ASSURANCE

A. Manufacturer Qualifications: A concrete ready-mixed producer experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94 requirements for production facilities and equipment.

B. Only one source of cementitious materials and aggregates shall be used on any one structure. Concrete shall be uniform in color and appearance.

C. Furnish manufacturer or supplier certifications for all products and materials.

D. Well in advance of placing concrete, the Contractor shall discuss with the Engineer the sources of individual materials and batched concrete proposed for use.

E. Concrete Preinstallation Conference: Engineer will conduct conference at a mutually agreed upon time and place no less than 21 calendar days prior to the first placement of structural concrete.

1. Review concrete design mixture(s) and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:

    a. Construction manager's representative/superintendent
    b. Ready-mix concrete manufacturer
    c. Concrete subcontractor
    d. Independent testing agency
    e. Concrete pumping subcontractor
    f. Admixture manufacturer's representative
    g. Engineer

2. Review requirements for Cast-in-Place Concrete and related Sections, including: inspection and testing agency procedures for field quality control, concrete finishes and finishing, hot and cold weather concreting procedures, curing procedures, construction, contraction, and isolation joints, joint fillers, waterstops, forms and form removal, shoring, and reshoring, vapor-retarder installation, anchor rod and anchorage device installation, steel reinforcement installation, floor and slab flatness and levelness measurement, concrete repair procedures, and concrete protection.

3. Contractor shall discuss placement methods, installation of waterstop, and concrete curing. Contractor shall propose methods and practices for implementing hot and cold weather concreting.

4. Contractor, ready-mix concrete manufacturer, and plasticizer (high-range water reducer) manufacturer's representative shall be available to discuss the properties and techniques of batching and placing plasticized concrete.

F. If during the progress of the Work, it is impossible to secure concrete of the required workability and strength with the materials being furnished, the Engineer may order such changes in proportions or materials, or both, as may be necessary to secure the desired properties. All changes so ordered shall be made at the Contractor's expense.

G. If during the progress of the Work, the materials from the sources originally accepted change in characteristics, the Contractor shall, at his/her expense, make new acceptance tests of aggregates and establish new design mixes. Such testing and design shall be accomplished with the assistance of an independent testing laboratory acceptable to the Engineer.

H. Reinforced concrete shall comply with ACI 318, ACI 350, and other stated specifications, codes and standards.

I. The responsibility for field testing is defined in Section 01450, Field Quality Control. However, the Contractor shall provide sufficient quality assurance field testing of concrete to provide confirmation of the concrete quality. Such quality assurance testing shall be at no additional cost to the Owner. Methods of testing will comply with the latest applicable ASTM methods.

J. Samples of constituents and of concrete as-placed will be subjected to laboratory tests. All materials incorporated in the Work shall conform to accepted samples.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Cement: Store in weathertight buildings, bins, or silos to provide protection from dampness and contamination and to minimize warehouse set.

B. Coarse Aggregate: Arrange and use stockpiles to avoid excessive segregation or contamination with other materials or with other sizes of like aggregates. Do not use frozen or partially frozen aggregate.

C. Fine Aggregate: Arrange and use stockpiles to avoid contamination. Allow fine aggregate to drain to a uniform moisture content before using. Do not use frozen or partially frozen aggregates.

D. Admixtures: Store in closed containers to avoid contamination, evaporation or damage. Provide suitable agitating equipment to assure uniform dispersion of ingredients in admixture solutions which tend to separate. Protect liquid admixtures from freezing and other temperature changes which could adversely affect their characteristics.

E. Pozzolan: Store in weathertight buildings, bins, or silos to provide protection from dampness and contamination.

F. Sheet Curing Materials: Store in weathertight buildings or off the ground and under cover.

G. Liquid curing compounds: Store in closed containers and in accordance with manufacturer’s written instructions.

PART 2 PRODUCTS

2.01 GENERAL

A. The use of manufacturer's name and model or catalog number is for the purpose of establishing the standard of quality and general configuration desired.

B. Like items or materials shall be the end products of one manufacturer in order to provide standardization for appearance, maintenance, and manufacturer's service.

2.02 MATERIALS

A. Materials shall comply with these Specifications and any applicable state or local requirements.

B. Cement: Domestic Portland cement complying with ASTM C150 or domestic blended cement complying with ASTM C595. Air entraining cements shall not be used. Cement brand shall be subject to approval by the Engineer and one brand shall be used throughout the Work. Refer to Table 1 for cement type(s) to be used with each class of concrete.

C. Fine aggregate: Washed natural sand conforming to the requirements of ASTM C33.

D. Coarse aggregate: Well-graded crushed stone or washed gravel conforming to the requirements of ASTM C33. Grading requirements shall be listed in ASTM C33 Table 2 for the specified coarse aggregate size number. Limits of Deleterious Substances and Physical Property Requirements shall be as listed in ASTM C33 Table 3 for severe weathering regions. Aggregates shall be free of any materials or substances with deleterious reactivity to alkalis in cement. Size numbers for concrete mixes as shown in Table 1 herein. The nominal maximum size of coarse aggregate can't exceed one-fifth (1/5) the narrowest form dimension, one-third (1/3) of slab total thickness, and three-fourth (3/4) the minimum clear spacing between reinforcing steel bars.

E. Water: Mixing water for concrete and water used to make ice shall be potable water free from injurious amounts of oil, alkali, organic matter, or other deleterious substances, and meet the requirements of ASTM C1602.

F. Admixtures: Admixtures shall be free of chlorides and alkalis (except for those attributable to water). When it is required to use more than one (1) admixture in a concrete mix, the admixtures shall be from the same manufacturer. Admixtures shall be compatible with the concrete mix including other admixtures.

1. Air entraining admixture. The admixture shall comply with ASTM C260. Proportioning and mixing shall be in accordance with manufacturer's recommendations.

2. Water reducing agent. The admixture shall comply with ASTM C494, Type A. Proportioning and mixing shall be in accordance with manufacturer's recommendations.

3. Mid-Range Water Reducer. The admixture shall comply with ASTM C494, Type A and Type F. Proportioning and mixing shall be in accordance with manufacturer's recommendations.

4. High-Range Water Reducer (Plasticizer). The admixture shall comply with ASTM C494 Type F or Type G and shall result in non-segregating plasticized concrete with little bleeding and with physical properties of low water/cementitious ratio concrete. The treated concrete shall be capable of maintaining plastic state in excess of 30 minutes to two (2) hours depending upon the product used. Proportioning and mixing shall be in accordance with manufacturer's recommendations.

5. Crystalline waterproofing admixture. The admixture provides a chemical treatment for the waterproofing, protection, and improvement of concrete inherent to water containing structures. The admixture shall be XYPEX C-500, C-1000, or approved equal, depending upon whether a normal or mildly delayed set is desired.

6. Retarding Admixtures. Admixtures that retard the setting time of concrete shall not be used without written approval from the Engineer. When allowed, the admixtures shall comply with ASTM C494, Type B for retarding admixtures.

7. Accelerating Admixtures. Admixtures that accelerated setting time of concrete shall not be used without written approval from the Engineer. When allowed, the admixtures shall comply with ASTM C494, Type C for accelerating admixtures.

G. Pozzolan (Fly ash)

1. Pozzolan shall be Class C fly ash complying with ASTM C618, including the requirements of Table 1 except the Loss of Ignition (LOI) shall be limited to 3 percent (3%) maximum.

2. Testing of the fly ash and/or the fly ash and concrete mixture is required to provide test data confirming that the fly ash in combination with the cement to be used meets all strength requirements and is compatible with the other concrete additives. Provide material certifications from the fly ash supplier.

H. Sheet Curing Materials: Waterproof paper, polyethylene film, or white burlap-polyethylene sheeting all complying with ASTM C171.

I. Liquid Curing Compound: Liquid membrane-forming curing compound shall comply with the requirements of ASTM C309 Type 1-D (clear or translucent with fugitive dye) and shall contain no wax, paraffin, or oil.

J. Vapor Retarder: Vapor retarder shall meet the requirements of ASTM E1745 Class A and be Stego Wrap 10 mil Class A vapor retarder or approved equal. Include manufacturer's recommended adhesive, pressure-sensitive joint tape and other accessories as required.

2.03 CONCRETE MIXES

A. Development of mix designs and testing shall be by a concrete ready-mix supplier acceptable to the Engineer, engaged by and at the expense of the Contractor.

B. Select proportions of ingredients to meet the design strength and materials limits specified in Table 1 and produce concrete having proper workability, durability, strength, appearance, and other required properties. Proportion ingredients to produce a homogenous mixture which will readily work in corners and angles of forms and around reinforcement without permitting materials to segregate or allowing excessive free water to collect on the surface.

C. Prepare concrete mix designs for each type and strength of concrete, proportioned on the basis of field test records or laboratory trial mixtures in accordance with ACI 301 and ACI 350. Concrete design mixes shall be based on historical experience with prior mixes or, if historical data and test records are not available, be developed by laboratory trial mixtures.

1. Concrete mix designs proportioned based on historical experience - Field test records used shall be from prior concrete mixes with materials, mixture proportions, quality control procedures, and conditions similar to those expected and for a class of concrete within 1000 psi of that specified for the Work. The set of field strength test records for each class of concrete shall be no more than 24 months old (12 months old for concrete mixes proposed for liquid containing concrete structures)

and spanning not less than 45 calendar days in accordance with ACI 301 and ACI 350. Field test records shall be used to calculate sample standard deviation and establish the required average strength in accordance with ACI 301 and ACI 350. Proposed concrete mix designs shall produce an average compressive strength equal to or greater than the required average compressive strength.

2. Concrete mix designs proportioned based on trial mixtures - If acceptable field test records are not available, concrete mixtures shall be proportioned based on trial mixtures that comply with the following:

    a. Materials used in trial mixtures shall be those proposed for the work.

    b. A minimum of three (3) trial mixtures for each concrete class with a range of proportions that will produce a range of compressive strengths encompassing the required average compressive strength.

    c. Trial mixtures shall be proportioned to produce slumps within the range specified for the proposed work, and for air-entrained concrete, the air content shall be within the range specified for the proposed work.

    d. Make and cure at least three (3) 4 x 8-inch test cylinders for each trial mixture in accordance with ASTM C192 for each test age. Cylinders shall be tested at 7 and 28 days in accordance with ASTM C39.

    e. A curve shall be established showing the relationship between water to cementitious materials ratio and compressive strength. The curve shall be based on at least three points representing batches which produce strengths above and below that required. Each point shall represent the average of at least three test cylinders tested at seven (7) and 28 days.

    f. The compressive strength test results at 28 days shall be used to establish proportions of the concrete mixture proposed for the work. The required average strength of proposed concrete mixture shall exceed the specified concrete compressive strength by 1000 psi for concrete with a specified strength less than 3000 psi. For concrete with a specified strength of 3000 psi to 5000 psi, the required average strength of proposed concrete mixture shall exceed the specified concrete compressive strength by 1200 psi.

    g. The proposed concrete mixture for each class of concrete shall be that shown by the curve to produce the required average strength indicated, but in no case shall the maximum water to cementitious ratio specified in Table 1 be exceeded nor shall the minimum cementitious materials be less than specified in Table 1.

D. Compressive Tests: The proposed concrete mix or mixes shall be tested to demonstrate compliance with the compression strength requirements in conformity with the provisions of ACI 301.

E. Entrained air, as measured by ASTM C231, shall be as shown within the range of 4.0 to 7.0%.

1. If the air entraining agent proposed for use in the mix requires testing methods other than ASTM C231 to accurately determine air content, make special note of this requirement in the admixture submittal required under paragraph 1.04.

F. Slump of the concrete as measured by ASTM C143, shall be 2-inches to 4-inches maximum at the point of delivery with no tolerances. If a water reducer is used to increase the concrete slump, the slump shall be 2 to 4-inches maximum and measured at the point of delivery before a mid-range or high-range water reducer is added to the concrete mix. After the addition of a mid-range or high-range water reducer, concrete shall have a slump ranging from 6-inches to 9-inches maximum.

G. Proportion admixtures according to the manufacturer's recommendations. Two (2) or more admixtures specified may be used in the same mix provided that the admixtures in combination retain full efficiency and have no deleterious effect on the concrete or on the properties of each other.

H. Where synthetic reinforcing fibers are specified to be used in Table 1, fibers shall be added from the manufacturer's pre-measured bags and according to the manufacturer's recommendations in a manner which will ensure complete dispersion of the fiber bundles as single monofilaments within the concrete.

Table 1											
Concrete Class	**Cement 1**	**Compressive Strength 2**	**Minimum Cementitious Materials (Lb/yd^3)**	**Fine Aggregate 3**	**Coarse Aggregate 4**	**W/C Ratio 5**	**Fly Ash 6**	**AE 7**	**WR 8**	**HRWR 9**	**CWA 10**
A	C150 Type I or C595 Type 1L	2,500	423	C33	57	0.62 max	-	No	Yes	No	No
B	C150 Type I or C595 Type 1L	3,500	517	C33	57	0.54 max	15-25	Yes	Yes	No	No
C	C150 Type I or C595 Type 1L (MS)	4,500	564	C33	57	0.42 max	15-25	Yes	Yes	Yes	Yes(11)
D	C150 Type I or C595 Type 1L	5,000	658	C33	67	0.40 max	15-25	Yes	Yes	No	No
E(12)	C150 Type I or C595 Type 1L	3,000	470	C33	7	0.54 max	-	No	Yes	Yes	No

NOTES:

1. ASTM designation. ASTM C595 cements that include ASTM C1157 cements are not permitted. Limit content of limestone in ASTM C595 cements to 10 percent.
2. Minimum compressive strength in psi at 28 days
3. ASTM designation
4. Size Number in ASTM C33
5. W/C is Water Cementitious ratio by weight
6. Fly ash, percent of total cementitious material by weight. Reduce fly ash percentage to fifteen to twenty percent (15-20%) from October through March. Fly ash may be used in any mix in accordance with the requirements of Article 2.02.G and other provisions of this section
7. AE is air entraining admixture
8. WR is water reducing or mid-range water admixture
9. HRWR is high range water reducer
10. CWA is crystalline waterproofing admixture
11. Crystalline waterproofing admixture shall be added to all Class C Concrete proposed for water containing structures (i.e., base slabs, walls, etc.)
12. Class E Mix: Add 1.5 pounds of synthetic reinforcing fibers, as specified in Section 03200, Concrete Reinforcement, per cubic-yard of concrete

PART 3 EXECUTION

3.01 MEASURING MATERIALS

A. Concrete shall be composed of cementitious materials, fine aggregate, coarse aggregate, water, and admixtures as specified and shall be produced by a plant acceptable to the Engineer. The addition of any mid-range or high range water reducer to increase the concrete slump above the specified 4 inch maximum will occur on site after concrete has been tested for slump and air content (if as directed by Engineer).

B. Measure materials for batching concrete by weighing in conformity with and within the tolerances given in ASTM C94 except as otherwise specified. Scales shall have been certified by the local Sealer of Weights and Measures within one (1) year of use.

C. Measure the amount of free water in fine aggregates with a moisture meter. Compensate for varying moisture contents of fine aggregates. Record the number of gallons of water including ice as batched on printed batching tickets. Indicate on the batching ticket the allowable amount of water that can be added at the point of delivery.

D. Admixtures shall be dispensed either manually using calibrated containers or measuring tanks, or by means of an automatic dispenser approved by the manufacturer of the specified admixture.

1. Charge air-entraining and chemical admixtures into the mixer as a solution using an automatic dispenser or similar metering device.

2. Inject multiple admixtures separately during the batching sequence.

3.02 MIXING AND TRANSPORTING

A. Concrete shall be ready-mixed concrete produced by equipment acceptable to the Engineer. No hand-mixing will be permitted. Clean each transit mix truck drum and reverse drum rotation before the truck proceeds under the batching plant. Equip each transit-mix truck with a continuous, non-reversible, revolution counter showing the number of revolutions at mixing speeds.

B. Ready-mix concrete shall be transported to the site in watertight agitator or mixer trucks loaded not in excess of their rated capacities as stated on the name plate.

C. Prior to test sampling and placing concrete, water may be added at the point of delivery, as indicated below:

1. Concrete slump may be adjusted by adding water up to the allowable amount indicated on the delivery ticket. The water amount added shall not exceed the amount allowed in the accepted mixture proportions.

2. The addition of water shall not result in an exceedance of the maximum water/cementitious materials ratio of the concrete mix design, nor shall it result in an exceedance of the maximum permitted slump of 4 inches without the addition of approved concrete admixtures.

3. The amount of water added at the point of delivery shall be recorded on the concrete delivery ticket by the receiver of the concrete and the receiver shall initial the ticket.

4. Added water shall be incorporated by additional mixing of at least 35 revolutions.

5. Do not add water to the concrete after mid-range or high-range water reducing or plasticizing admixtures have been added to the concrete at the point of delivery.

6. Do not add water to the concrete after test sampling or during placement of the concrete.

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D. All central plant and rolling stock equipment and methods shall comply with ACI 318, ACI 350 and ASTM C94.

E. Select equipment of size and design to ensure continuous flow of concrete at the delivery end. Metal or metal-lined non-aluminum discharge chutes shall be used and shall have slopes not exceeding one (1) vertical to two (2) horizontal and not less than one (1) vertical to three (3) horizontal. Chutes more than 20 feet long and chutes not meeting slope requirements may be used if concrete is discharged into a hopper before distribution.

F. Re-tempering of concrete or mortar that has partially hardened (that is, mixing with or without additional cement, aggregate, or water) will not be permitted.

G. Handle concrete from mixer to placement as quickly as practicable while providing concrete of required quality in the placement area. Dispatch trucks from the batching plants so they arrive at the work site just before the concrete is required, thus avoiding excessive mixing of concrete while waiting or delays in placing successive layers of concrete in the forms.

H. Furnish a delivery ticket for ready mixed concrete to the Engineer as each truck arrives. Each ticket shall show the concrete mix designation, provide a printed record of the weight of cementitious materials and each aggregate as batched individually. Use the type of indicator that returns for zero punch or returns to zero after a batch is discharged. Clearly indicate the weight of fine and coarse aggregate, cementitious materials and water in each batch, the quantity delivered, the time any water is added, and the numerical sequence of the delivery. Show the time of day batched and time of discharge from the truck.

I. Temperature Mixing Time Control

1. In cold weather (see paragraph 3.07.D) maintain the as-mixed temperature of the concrete and concrete temperatures at the time of placement in the forms as indicated in Table 2.

2. If water or aggregate has been heated, combine water with aggregate in the mixer before cementitious material is added. Do not add cementitious material to mixtures of water and aggregate when the temperature of the mixture is greater than 90°F.

3. In hot weather, cool ingredients before mixing to maintain temperature of the concrete below the maximum placing temperature of 90°F. If necessary, substitute

well-crushed ice or chilled water for all or part of the mixing water. The water equivalent of ice shall be calculated and added to the total amount of mixing water. The specified water to cementitious materials ratio of the concrete mix shall not be exceeded by the addition of ice.

4. Discharge of the concrete shall be completed within 1-1/2 hours (90 minutes), after the introduction of the mixing water to the cementitious materials and aggregates or the introduction of the cementitious material to the aggregates. The maximum time interval between the addition of mixing water and/or cementitious material to the batch and placing of concrete in the forms shall be reduced to the maximum time in Table 2 for concrete mixtures that do not include retarders.

Table 2	
Ambient Air Temperature	**Maximum Time**
85°F to 90°F (32°C) higher than 90°F	75 minutes 60 minutes

The maximum time for discharge of concrete mixtures with an approved retarding admixture or high-range water reducing and retarding admixture shall not exceed 1-1/2 hours (90 minutes). Temperature of the concrete shall not exceed 90 Degrees F.

3.03 INSPECTION AND COORDINATION

A. The batching, mixing, transporting, placing, and curing of concrete shall be subject to the inspection of the Engineer at all times. The Contractor shall advise the Engineer of readiness to proceed with each concrete placement at least 24 hours in advance. The Engineer will inspect the preparations for concreting including the preparation of previously placed concrete; the reinforcing; and the alignment, cleanliness, and tightness of formwork. No placement shall be made without the inspection and acceptance of the Engineer.

3.04 CONCRETE APPEARANCE

A. Concrete mix showing either poor cohesion or poor coating of the coarse aggregate with paste shall be remixed. If this does not correct the condition, the concrete shall be rejected. If the slump is within the allowable limit, but excessive bleeding, poor workability, or poor finishability are observed, changes in the concrete mix shall be obtained only by adjusting one or more of the following:

1. The gradation of aggregate
2. The proportion of fine and coarse aggregate
3. The percentage of entrained air, within the allowable limits

B. Concrete for the Work shall provide a homogeneous structure which, when hardened, will have the required strength, durability, and appearance. Mixtures and workmanship shall be such that concrete surfaces, when exposed, will require no finishing. When concrete forms are stripped, the concrete when viewed in good lighting from 10 feet away shall be pleasing in appearance, and at 20 feet shall show no visible defects.

3.05 PLACING AND COMPACTING

A. Placing

1. Verify that all the formwork completely encloses concrete to be placed and is securely braced prior to concrete placement. Remove ice, excess water, dirt, and other foreign materials from forms. Confirm that reinforcement and other embedded items are securely in place. Have a competent workman at the location of the pour who can assure that reinforcement and embedded items remain in designated locations while concrete is being placed. Add water to semiporous subgrades or forms to eliminate suction of water from the mix. Seal extremely porous subgrades in an approved manner.

2. Deposit concrete as near its final position as possible to avoid segregation due to rehandling or flowing. Place concrete continuously at a rate which ensures the concrete is being integrated with fresh plastic concrete. Do not deposit concrete which has partially hardened or has been contaminated by foreign materials or on concrete which has hardened sufficiently to cause formation of seams or planes of weakness within the section. If the section cannot be placed continuously, place construction joints as specified or as approved.

3. Pumping of concrete will be permitted. Use a mix design suitable for pumping and submit for approval. The maximum size of coarse aggregate used in the mix should be limited to one-third of the smallest inside diameter of the delivery system.

4. Remove temporary spreaders from forms when the spreader is no longer useful. Temporary spreaders may remain embedded in concrete only when made of galvanized metal or concrete and if prior approval has been obtained.

5. Do not place concrete for supported elements until concrete previously placed in the supporting element (columns, slabs, and/or walls) has reached adequate strength. Prepare previously placed and hardened concrete surfaces by cleaning using steel brushes and applying bonding agent in accordance with manufacturer’s instructions.

6. Where surface mortar is to form the base of a finish, especially surfaces designated to be painted, work coarse aggregate back from forms with a suitable tool to bring the full surface of the mortar against the form. Prevent the formation of excessive surface voids.

7. Slabs

   a. After suitable bulkheads, screeds, and jointing materials have been positioned, the concrete shall be placed continuously between construction joints beginning at a bulkhead, edgeform, or corner. Each batch shall be placed into the edge of the previously placed concrete to avoid stone pockets and segregation.

   b. Avoid delays in casting. If there is a delay in casting, the concrete placed after the delay shall be thoroughly spaded and consolidated at the edge of that previously placed to avoid cold joints. Concrete shall then be brought to correct level and struck off with a straightedge. Bull floats or darbies shall be used to smooth the surface, leaving it free of humps or hollows.

c. Where slabs are to be placed integrally with the walls below them, place the walls and compact as specified. Allow one (1) hour to pass between placement of the wall and the overlying slab to permit consolidation of the wall concrete. Keep the top surface of the wall moist so as to prevent cold joints.

8. Formed Concrete

a. Place concrete in forms using tremie tubes and taking care to prevent segregation. Bottom of tremie tubes shall preferably be in contact with the concrete already placed. Do not permit concrete to drop freely more than 4-feet. Place concrete for walls in 12-inch to 24-inch lifts, keeping the surface horizontal. If plasticized concrete is used, the maximum lift thickness may be increased to 7 feet and the maximum free fall of concrete shall not exceed 15 feet.

B. Compacting

1. Consolidate concrete by vibration, puddling, spading, rodding, or forking so that concrete is thoroughly worked around reinforcement, embedded items, and openings, and into corners of forms. Puddling, spading, etc. shall be continuously performed along with vibration of the placement to eliminate air or stone pockets which may cause honeycombing, pitting, or planes of weakness.

2. All concrete shall be placed and compacted with mechanical vibrators. The number, type, and size of the units shall be approved by the Engineer in advance of placing operations. No concrete shall be ordered until sufficient approved vibrators (including standby units in working order) are on the job.

3. A minimum frequency of 7,000 revolutions per minute is required for mechanical vibrations. Insert vibrators and withdraw at points from 18 inches to 30 inches apart. At each insertion, vibrate sufficiently to consolidate concrete, generally from 5 to 15 seconds. Do not over vibrate so as to segregate. Keep a spare vibrator on the site during concrete placing operations.

4. Concrete Slabs: Concrete for slabs shall be consolidated with internal vibrators and (optionally) with vibrating screeds. Vibrators shall always be placed into concrete vertically and shall not be laid horizontally or laid over.

5. Walls and Columns: Internal vibrators (rather than form vibrators) shall be used unless otherwise approved by the Engineer. In general, for each vibrator needed to melt down the batch at the point of discharge, one or more additional vibrators must be used to densify, homogenize, and perfect the surface. The vibrators shall be inserted vertically at regular intervals, through the fresh concrete, and slightly into the previous lift, if any.

6. Amount of Vibration: Vibrators are to be used to consolidate properly placed concrete but shall not be used to move or transport concrete in the forms. Vibration shall continue until:

a. Frequency returns to normal
b. Surface appears liquefied, flattened, and glistening

c. Trapped air ceases to rise
d. Coarse aggregate has blended into surface but has not disappeared

3.06 INSTALLATION – CONCRETE TOPPING

A. Place concrete topping over concrete slabs at locations shown on the Drawings. The finished surface of the concrete topping and concrete structural slab below the concrete topping shall be as specified in Section 03350 Concrete Finishes.

B. Prior to placing concrete topping remove the debris and clean the surface by sweeping and vacuuming of all dirt and other foreign materials. Wash structural slab clean removing any oils or grease.

C. Saturate the concrete surface prior to placement of the concrete topping slab. Saturation may be achieved by ponding, by the use of soaker hoses, or by other methods acceptable to the Engineer. Remove excess free-standing water from the structural slab just prior to placement of the concrete topping. The structural slab surface receiving the concrete topping shall be saturated and surface dry.

D. Thoroughly broom a cement slurry into the concrete structural slab surface immediately ahead of placing the concrete topping so that the slurry is moist when the grout is placed. Work the slurry over the surface until the surface is coated with approximately 1/16- to 1/8-inch-thick cement paste.

1. A bonding grout may be substituted for the cement slurry. The bonding grout shall be composed of one part Portland cement, 1.5 parts fine sand, an approved bonding admixture, and water mixed to achieve the consistency of thick paint.

E. Provide tooled control joints as indicated on the Drawings.

F. Finish and cure the concrete topping as specified in this Specification.

G. Concrete or cement grout topping to be placed by mechanical process equipment shall be as specified in other sections of these Specifications.

3.07 CURING AND PROTECTION

A. Protect all concrete work against damage from the elements and defacements of any nature during construction operations.

B. Curing Methods

1. Curing Methods for Concrete Surfaces: Cure concrete to retain moisture and maintain specified temperatures at the surface for a minimum of seven (7) days after placement. Curing methods to be used are as follows:

a. Water Curing: Keep entire concrete surface wet by ponding, continuous sprinkling, or covered with saturated burlap. Begin wet cure as soon as concrete attains an initial set and maintain wet cure over 24 hours a day.

b. Sheet Material Curing: Cover entire surface with sheet material. Securely anchor sheeting to prevent wind and air from lifting the sheeting or entrapping air under the sheet. Place and secure sheet as soon as initial concrete set occurs.

c. Liquid Membrane Curing: Apply over the entire concrete surface except for surfaces to receive additional concrete. Curing compound shall not be placed on any concrete surface where additional concrete is to be placed, where surface coatings are to be used, or where the concrete finish requires an integral floor product. Curing compound shall be applied as soon as the free water on the surface has disappeared and no water sheen is visible, but not after the concrete is dry or when the curing compound can be absorbed into the concrete. Application shall be in compliance with the manufacturer's recommendations.

2. Specified applications of curing methods:

a. Slabs for Water Containment Structures: Water curing only

b. Slabs on Grade and Footings (not used to contain water): Water curing, sheet material curing, or liquid membrane curing

c. Structural Slabs (other than water containment): Water curing or liquid membrane curing

d. Horizontal Surfaces that will receive additional concrete, coatings, grout, or other material that requires bond to the substrate: Water curing

e. Formed Surfaces: None if non-absorbent forms are left in place seven (7) days. Water cure if absorbent forms are used. Sheet cured for liquid containing walls and other parts of the work required to be watertight if forms are removed prior to seven (7) days. Concrete shall be maintained in a moist condition for the seven (7) day curing period. Sheet cured or liquid membrane cured for other formed surfaces not required to be watertight if forms are removed prior to seven (7) days. Exposed horizontal surfaces of formed walls or columns shall be water cured for seven (7) days or until next placement of concrete is made

f. Concrete Joints: Water cured or sheet material cured

C. Cold Weather Concreting

1. For this Specification, "cold weather" is defined as a period when, for more than three (3) consecutive days, the average daily outdoor temperature is less than 40°F. The average daily temperature shall be calculated as the average of the highest and the lowest temperature during the period from midnight to midnight.

2. Concrete placed during cold weather shall be batched, delivered, cured, and protected in compliance with the recommendations of ACI 306R and the additional requirements of this Section.

3. The Contractor shall discuss proposed cold weather work plan with the Engineer. The discussion shall encompass the methods and procedures proposed for use

during the cold weather including the production, transportation, placement, protection, curing, and temperature monitoring of the concrete. The procedures to be implemented upon abrupt changes in weather conditions or equipment failures shall also be discussed. Cold weather concreting shall not begin until the work plan is acceptable to the Engineer.

4. The minimum temperature of concrete immediately after placement and during the protection period shall be as indicated in Table 3. The temperature of the concrete in place and during the protection period shall not exceed these values by more than 20°F. Prevent overheating and non-uniform heating of the concrete.

Table 3
Concrete Temperatures Minimum Dimension of Section

	<12 inches	12 to 36 inches
Min. concrete temperature:	55°F	50°F

5. During periods of cold weather, concrete shall be protected to provide continuous warm, moist curing (with supplementary heat when required) for a total of at least 350 degree-days of curing.

   a. Degree-days are defined as the total number of 24-hour periods multiplied by the weighted average daily air temperature at the surface of the concrete (e.g., 5 days at an average 70°F = 350 degree-days).

   b. To calculate the weighted average daily air temperature, sum hourly measurements of the air temperature in the shade at the surface of the concrete taking any measurement less than 50°F as 0°F. Divide the sum thus calculated by 24 to obtain the weighted average temperature for that day.

6. Salt, manure, or other chemicals shall not be used for protection.

7. At the end of the protection period, allow the concrete to cool gradually to the ambient temperature. If water curing has been used, the concrete shall not be exposed to temperatures below those shown in Table 3 unless at least 24 hours has elapsed since water curing has been terminated.

8. During periods not defined as cold weather, but when freezing temperatures are expected or occur, protect concrete surfaces from freezing for the first 24 hours after placing.

D. Hot Weather Concreting

1. For this Specification, "hot weather" is defined as any combination of high air temperatures, low relative humidity and wind velocity which produces a rate of evaporation as estimated in ACI 305R, approaching or exceeding 0.2 pounds per square foot per hour (lb/ft²-hr).

2. Concrete placed during hot weather, shall be batched, delivered, placed, cured, and protected in compliance with the recommendations of ACI 305R and the additional requirements of this Specification.

    a. Temperature of concrete being placed shall not exceed 90°F and every effort shall be made to maintain a uniform concrete mix temperature below this level. The temperature of the concrete shall be such that it will cause no difficulties from loss of slump, flash, set, or cold joints.

    b. All necessary precautions shall be taken to promptly deliver, to promptly place the concrete upon its arrival at the job and to provide vibration immediately after placement.

    c. The Engineer may direct the Contractor to immediately cover plastic concrete with sheet material.

3. The Contractor shall discuss with the Engineer a work plan describing the methods and procedures he/she proposes to use for concrete placement and curing during hot weather periods. Hot weather concreting shall not begin until the work plan is acceptable to the Engineer.

3.08 REMOVAL OF FORMS

A. Except as otherwise specifically authorized by the Engineer, forms shall not be removed before the concrete has attained a strength of at least 30 percent (30%) of its specified strength, nor before reaching the number of degree-days of curing as indicated in Table 4 (whichever is longer).

Table 4	
Forms for	**Degree Days**
Beams and slabs	500
Walls and vertical surfaces	100

(See definition of degree-days in paragraph 3.07.C.5.a)

B. Shores shall not be removed until the concrete has attained at least 70 percent (70%) of its specified design strength and sufficient strength to support safely its own weight and the construction live loads upon it.

C. When removal of formwork is based on concrete reaching a specified in-place compressive strength, concrete strength data shall be based on tests of a “field set” of field-cured cylinders. The field-cured cylinders shall be cured under the same conditions for the concrete the test specimens represent. Cure the cylinders under the same temperature and moisture conditions as used for the concrete they represent.

3.09 FIELD TESTS

A. Composite samples of fresh concrete shall be obtained in accordance with ASTM C172. Sets of field control cylinder specimens will be taken during the progress of the Work, in compliance with ASTM C31. The number of sets of concrete test cylinders taken of each

class of concrete placed each day shall not be less than once a day, nor less than once for each 50 cubic-yards of concrete.

1. Cast and laboratory cure a "set" of test cylinders shall consist of five (5) 4-inch by 8-inch cylinders: one (1) to be broken at seven (7) days and three (3) to be broken and their strengths averaged at 28 days. The fifth may be used for a special break at three (3) days or to verify strength after 28 days if 28 days breaks are low.

2. Cast and field cure a “field set” of test cylinders from the composite sample when verification of concrete reaching a specified in-place compressive strength is required for removal of formwork. The “field set” of test cylinders is in addition to the laboratory cured “set” of test cylinders. A “field set” of test cylinders shall consist of a minimum of three (3) 4-inch by 8-inch cylinders. The three (3) cylinders shall be broken and their strengths averaged to determine the in-place compressive strength at the concrete age requested by the Contractor. The cost of additional field cured concrete cylinders cast and tested shall be by the Contractor.

3. Cylinders should be capped before testing to maintain a uniform load distribution. Cylinders are general capped with sulfur mortar in compliance with ASTM C617 or neoprene pad caps in compliance with ASTM C1231.

4. When the average 28-day compressive strength of the cylinders in any set falls below the required compressive strength or below proportional minimum seven-day strengths (where proper relation between 7- and 28-day strengths have been established by tests), proportions, water content, or temperature conditions shall be changed to achieve the required strengths.

B. The Contractor shall cooperate in the making of tests by allowing free access to the work for the selection of samples; providing an insulated closed curing box for specimens; affording protection to the specimens against damage or loss through Contractor’s operations; and furnishing material and labor required for the purpose of taking concrete cylinder samples. Curing boxes shall be acceptable to the Engineer.

C. Slump tests will be made in the field immediately prior to placing the concrete. Such tests shall be made in accordance with ASTM C143. If the slump is greater than the specified range, the concrete shall be rejected. If slump test resulted in a shear slump failure, the slump test should be repeated. If shear slump failure re-occurs the concrete batch is to be rejected.

D. Slump flow tests will be made in the field immediately prior to placing Self Compacting Concrete (SCC) in compliance with ASTM C1611. Slump flow spread average diameters should not exceed 30 inches.

E. Air Content: Test for air content shall be made on a fresh concrete sample. Air content for concrete made of ordinary aggregate having low absorption shall be made in compliance with either the pressure method complying with ASTM C231 or by the volumetric method complying with ASTM C173. If lightweight aggregates or aggregates with high absorptions are used, the latter test method shall be used.

F. Temperature. Test for temperature shall be made on a fresh concrete sample in accordance with ASTM C1064.

G. Density. Test for density shall be made in accordance with ASTM C138.

3.10 FIELD CONTROL

A. The Engineer may require that cores be taken from any questionable area in the concrete work such as construction joints and other locations as required for determination of concrete quality. The results of tests on such cores shall be the basis for acceptance, rejection, or determining the continuation of concrete work.

B. The Contractor shall cooperate in obtaining cores by allowing free access to the Work and permitting the use of ladders, scaffolding and such incidental equipment as may be required. The Contractor shall repair all core holes. The work of cutting and testing the cores will be in accordance with Section 01450, Field Quality Control.

3.11 FAILURE TO MEET REQUIREMENTS

A. Strength of concrete will be satisfactory if every average of three consecutive strength tests equals or exceeds the specified compressive strength and no compressive strength test value falls below the specified compressive strength by more than 500 psi. If either of these two requirements are not met, the Engineer shall have the right to require changes in proportions outlined to apply to the remainder of the Work. Furthermore, the Engineer shall have the right to require additional curing on those portions of the structure represented by the test specimens which failed. The cost of such additional curing shall be at the Contractor's expense. In the event that such additional curing does not give the strength required, as evidenced by core and/or load test, the Engineer shall have the right to require strengthening or replacement of those portions of the structure which fail to develop the required strength. The cost of all such core borings and/or load tests and any strengthening or concrete replacement required because strengths of test specimens are below that specified, shall be entirely at the expense of the Contractor. In such cases of failure to meet the strength requirements the Contractor and Engineer shall confer to determine what adjustment, if any, can be made in compliance with the subsections titled "Strength" and "Failure to Meet Strength Requirements" of ASTM C94. The “purchaser” referred to in C94 is the Contractor in this Specification.

B. When the tests on control specimens of concrete fall below the required strength, the Engineer will permit check tests for strengths to be made by means of typical cores drilled from the structure in compliance with ASTM C42 and C39. Concrete in an area represented by core tests shall be considered satisfactory if the average of three cores is equal to at least 85 percent of the specified compressive strength and no single core is less than 75 percent of the specified compressive strength. Additional testing of cores extracted from locations represented by erratic core strength results may be permitted. In the case of failure of the cores, the Engineer, in addition to other resources, may require, at the Contractor's expense, load tests on any one of the slabs, beams, piles, caps, and columns in which such concrete was used. Test need not be made until concrete has aged 60 days.

C. Should the strength of test cylinders fall below 60 percent (60%) of the required minimum 28-day strength, the concrete shall be rejected and shall be removed and replaced.

3.12 PATCHING

A. As soon as the forms have been stripped and the concrete surfaces exposed, fins and other projections shall be removed; recesses left by the removal of form ties shall be filled; and surface defects, which do not impair structural strength, shall be repaired. Clean all exposed surfaces and adjoining work stained by leakage of concrete, to approval of the Engineer.

B. Immediately after removal of forms remove plugs and break off metal ties as required by Section 03100, Concrete Formwork. Holes are then to be promptly filled upon stripping as follows: Moisten the hole with water, followed by a 1/16-inch brush coat of neat cement slurry mixed to the consistency of a heavy paste. Immediately plug the hole with a 1 to 1.5 mixture of cement and concrete sand mixed slightly damp to the touch (just short of "balling"). Hammer the grout into the hole until dense, and an excess of paste appears on the surface on the form of a spiderweb. Trowel smooth with heavy pressure. Avoid burnishing.

C. When patching exposed surfaces, the same source of cement and sand as used in the parent concrete shall be employed. Adjust color, if necessary, by addition of proper amounts of white cement. Rub lightly with a fine Carborundum stone at an age of one (1) to five (5) days if necessary to bring the surface down with the parent concrete. Exercise care to avoid damaging or staining the virgin skin of the surrounding parent concrete. Wash thoroughly to remove all rubbed matter.

3.13 REPAIRS

A. It is the intent of this Specification to require quality work including adequate forming, proper mixture and placement of concrete, and curing so completed concrete surfaces will require no patching.

B. Defective concrete and honeycombed areas as determined by the Engineer shall be repaired as specified in Section 03740, Modification or Repair of Existing Concrete.

3.14 SCHEDULE

A. The following (Table 5) represents the general applications for the various concrete classes and design strengths:

Table 5

Class	Design Strength (psi)	Description
A	2,500	Concrete fill and duct and pipe encasement
B	3,500	Concrete overlay slabs (sidewalks) and pavements
C	4,500	Base slabs and walls for liquid containing structures shall require crystalline water proofing admixture, CWA. Refer to Paragraph 2.03H Table 1
C	4,500	Walls, slabs on grade, suspended slab and beam systems, columns, grade beams and all other structural concrete
D	5,000	Precast and precast prestressed concrete
E	3,000	Concrete topping over precast roof tees

END OF SECTION

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SECTION 03350

CONCRETE FINISHES

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment, and incidentals required to finish cast-in-place concrete and surfaces as shown in the Drawings and as specified herein.

1.02 MATERIALS COMPLIANCE WITH AIS

A. P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), includes an “American Iron and Steel (AIS)” requirement in section 436 that requires Clean Water State Revolving Loan Fund (CWSRF) and Drinking Water State Revolving Loan Fund (DWSRF) assistance recipients to use iron and steel products that are produced in the United States for projects for the construction, alteration, maintenance, or repair of a public water system or treatment works. This Project meets the definition of such work, and the Environment Protection Agency (EPA) implementation requirements for this AIS requirement are outlined within the DWSRF memorandum titled “Implementation of American Iron and Steel provisions of P.L. 113-76, Consolidated Appropriations Act, 2014” included as part of the RLF Supplemental General Conditions.

B. All parties are required to comply with these requirements and to ensure that all qualifying iron and steel products used in this project must be produced in the United States. See RLF Supplemental General Conditions for additional details.

1.03 RELATED SECTIONS

A. Section 01300 – Submittals

B. Section 03100 – Concrete Formwork

C. Section 03300 – Cast-in-Place Concrete

D. Section 03600 – Grout

E. Section 03740 – Modification or Repair of Existing Concrete

F. Division 07 – Thermal and Moisture Protection

G. Division 09 – Finishes

1.04 REFERENCE STANDARDS

A. ASTM International (ASTM), latest edition:

1. ASTM C33 Standard Specification for Concrete Aggregates

2. ASTM C150 Standard Specification for Portland Cement

3. ASTM C171 Standard Specification for Sheet Materials for Curing Concrete

4. ASTM C309 Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete

5. ASTM C881 Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete

B. American Concrete Institute (ACI), latest edition:

1. ACI 117 Specifications for Tolerances for Concrete Construction and Materials and Commentary

2. ACI 301 Specifications for Structural Concrete

3. ACI 308R Guide to External Curing Concrete

4. ACI 503.4 Standard Specifications for Repairing Concrete with Epoxy Mortars

1.05 SUBMITTALS

A. See Section 01300, Submittals for submittal procedures. Product data shall include the following:

1. Concrete sealer: Confirmation that the sealer is compatible with additionally applied coatings shall also be submitted.

1.06 QUALITY ASSURANCE

A. Finishes

1. For concrete which will receive applied finishes or materials, the surface finish specified is required for the proper application of the specified manufacturer's products. Where alternate products are approved for use, determine if changes in finishes are required and provide the proper finishes to receive these products.

2. Changes in finishes made to accommodate products different from those specified shall be performed at no additional cost to the Owner. Submit the proposed new finishes and their construction methods to the Engineer for approval.

B. Services of Manufacturer's Representative

1. The Contractor shall make available at no extra cost to the Owner, upon 72-hour notification, the services of a qualified field representative of the manufacturer of curing compound, sealer or hardener to instruct the user on the proper application of the product under prevailing job conditions.

PART 2 PRODUCTS

2.01 MATERIALS

A. Concrete sealer shall be "Protecrete" by Advanced Concrete Technology Inc., Dallas, Texas, or approved equal.

PART 3 EXECUTION

3.01 FORMED SURFACES

A. Forms shall not be removed before the requirements of Section 03300, Cast-in-Place Concrete, have been satisfied.

B. Exercise care to prevent damaging or obliterating the lines of chamfers, rustications, or corners when removing the forms or performing any other work adjacent thereto.

C. Surface defects to be repaired include form-tie holes, honeycombs and air voids, rock pockets, and any visible joints.

D. Repair of surface defects shall result in a fair concrete surface with uniform color and free from shrinkage cracks.

E. Clean all exposed concrete surfaces and adjoining work stained by leakage of concrete.

F. Rough-Form Finish

1. Immediately after stripping forms and before concrete has changed color, carefully remove all fins and projections.

2. Promptly fill holes left by tie cones and defects as specified in Section 03300, Cast-in-Place Concrete.

G. Rubbed Finish

1. Immediately upon stripping forms and before concrete has changed color, carefully remove all fins. While the wall is still damp, apply a thin coat of medium consistency neat cement slurry by means of a stiff bristle brush to provide a bonding coat within all pits, air holes, or blemishes in the parent concrete. Avoid coating large areas with the slurry at one time.

2. Before the slurry has dried or changed color, apply a dry (almost crumbly) grout proportioned by volume and consisting of 1-part cement to 1-1/2-parts of clean masonry sand having a fineness modulus of approximately 2.3 and complying with the gradation requirements of ASTM C33 for such a material. Grout shall be uniformly applied by means of damp pads of coarse burlap approximately 6-inch square used as a float. Scrub grout into the pits and air holes to provide a dense mortar in all imperfections.

3. Allow the mortar to partially harden for 1 to 2 hours depending upon the weather. If the air is hot and dry, keep the wall damp during this period using a fine, fog spray.

When the grout has hardened sufficiently so it can be scraped from the surface with the edge of a steel trowel without damaging the grout in the small pits or holes, cut off all that can be removed with a trowel. (Note: Grout allowed to remain on the wall too long will harden and will be difficult to remove.)

4. Allow the surface to dry thoroughly and rub it vigorously with clean dry burlap to completely remove any dried grout. No visible film of grout shall remain after this rubbing. The entire cleaning operation for any area must be completed the day it is started. Do not leave grout on surfaces overnight. Allow sufficient time for grout to dry after it has been cut off with the trowel so it can be wiped off clean with the burlap.

5. On the day following the repair of pits, air holes, and blemishes, the walls shall again be wiped off clean with dry, used pieces of burlap containing old, hardened mortar, which will act as a mild abrasive. After this treatment, there shall be no built-up film remaining on the parent surface. If, however, such a film is present, a fine abrasive stone shall be used to remove all such material without breaking through the surface film of the original concrete. Such scrubbing shall be light and sufficient only to remove excess material without changing the texture of the concrete.

6. A thorough wash-down with stiff bristle brushes shall follow the final bagging or stoning operation. No extraneous materials shall remain on the surface of the wall. The wall shall be sprayed with a fine spray periodically to maintain a continually damp condition for at least three (3) days after the application of the repair grout.

7. Prepare a sample area where the texture and color of the final surface will be established as the job standard. Sample area shall be a minimum 4-foot high by 8-foot wide as directed by Engineer on a portion of new wall construction for which will be exposed in the final Work. Final accepted sample shall remain exposed to serve as the job standard for Rubbed Finish.

H. Abrasive Blast Finish

1. Coordinate with rubbed finish application. Do not begin until rubbed finish operation is complete or before concrete has reached minimum seven-day strength. The rubbed finish application may be deleted by the Engineer if the unfinished concrete surface is of superior quality. Apply the abrasive blast finish only where indicated in schedule of finishes.

2. Prepare a sample area of minimum 4-foot high by 16-foot-wide blast finish as directed by Engineer on a portion of new wall construction which will not be exposed in the final Work. Sample area shall contain a variety of finishes obtained with different nozzles, nozzle pressure, grit materials, and blasting techniques for selection by Engineer. Final accepted sample shall remain exposed until completion of all blast finish operations.

3. Blast finish operation shall meet all regulatory agency requirements. Blast finish contractor shall be responsible for obtaining all required permits and/or licenses.

4. Perform abrasive blast finishing in as continuous an operation as possible, utilizing the same work crew to maintain continuity of finish on each surface or area of work. Maintain patterns or variances in depths of blast as present on the accepted sample.

5. Upon completion of the blast finish operation, thoroughly flush finished surfaces with potable water to remove residual dust and grit. Allow air to dry until curing of concrete is complete.

3.02 FLOORS AND SLABS

A. Floated Finish

1. Machine Floating

a. Screed floors and slabs with straightedges to the established grades shown on the Drawings

b. When the concrete has hardened sufficiently to support the weight of a power float without it digging into or disrupting the level surface, thoroughly float the surface with a heavy revolving disc type power compacting machine capable of providing a 200-pound compaction force distributed over a 24-inch diameter disc.

c. Start floating along walls and around columns and then move systematically across the surface leaving a matte finish.

d. Troweling machines equipped with float (shoe) blades that are slipped over the trowel blades may be used for floating. Floating with a troweling machine equipped with normal trowel blades will not be permitted. The use of any floating or troweling machine which has a water attachment for wetting the concrete surface during finishing will not be permitted.

2. Hand Floating

a. In lieu of power floating, small areas may be compacted by hand floating. Screed the floors and slabs with straightedges to the established grades shown on the Drawings. While the concrete is still green, but sufficiently hardened to support a finisher and kneeboards with no more than 1/4-inch indentation, wood float to a true, even plane with no coarse aggregate visible. Use sufficient pressure on the wood floats to bring moisture to the surface.

3. Finishing Tolerances

a. Finishing tolerances should be in compliance with requirements of ACI 117.

b. Where elastomeric bearing pads are used, the finished surface upon which bearing pad is placed shall not vary more than 1/16 inch from a 10-foot straightedge placed in any direction across the area.

c. Level floors and slabs tolerance should conform to the following applicable classification:

1) Very Flat Tolerance: plane maximum variation of 1/8 inch in 10 feet when measured with a 10-foot straightedge places in any direction

2) Flat Tolerance: plane maximum variation of 3/16 inch in 10 feet when measured with a 10-foot straightedge placed in any direction

3) Straightedge Tolerance: plane maximum variation of 5/16 inch in 10 feet when measured with a 10-foot straightedge placed in any direction

d. Failure to meet either of the above requirements shall be cause for removal, grinding, or other correction as directed by the Engineer.

B. Broomed Finish

1. Screed slabs with straightedges to the established grades indicated on the Drawings. When the concrete has stiffened sufficiently to maintain small surface indentations, draw a stiff bristle broom lightly across the surface in the direction of drainage, or, in the case of walks and stairs, perpendicular to the direction of traffic to provide a non-slip surface. The surface texture shall be uniform in appearance without patches of non-textured surface.

C. Steel Trowel Finish

1. Finish concrete as specified in paragraph 3.02.A. Then, apply troweling and consolidate by hand or power-driven steel trowel to a smooth hard even finish free from high or low spots or other defects. Troweling of concrete shall begin as soon as concrete has hardened so that water and fine material are not brought to the surface. Excess water should be allowed to evaporate or be removed with a squeegee prior to troweling. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that may telegraph through applied coatings or floor coverings.

D. Concrete Sealer

1. Prepare and seal surfaces indicated on the room finish schedule to receive a sealer as follows:

a. Finish concrete as specified in the preceding paragraphs and in accordance with the schedule in paragraph 3.04.

b. Newly Placed Concrete: Surface must be sound and properly finished. Surface is application-ready when it is damp but not wet and can no longer be marred by walking workmen.

c. Newly Cured Bare Concrete: Level any spots gouged out by trades. Remove all dirt, dust, droppage, oil, grease, asphalt, and foreign matter. Cleanse with caustics and detergents as required. Rinse thoroughly and allow to dry so that the surface is no more than damp, and not wet.

d. Aged Concrete: Restore surface soundness by patching, grouting filling cracks and holes, etc. Surface must also be free of any dust, dirt, and other foreign matter. Use power tools or strippers to remove any incompatible sealers or

coatings. Cleanse as required, following the procedure indicated under cured concrete.

e. Methods: Apply sealer so as to form a continuous, uniform film by spray, soft-bristle push broom, long-nap roller or lambswool applicator. Ordinary garden-type sprayers, using neoprene hose, are recommended for best results.

f. Applications: For curing only, apply first coat evenly and uniformly as soon as possible after final finishing at the rate of 200 to 400 square-feet per gallon. Apply second coat when all trades are completed, and structure is ready for occupancy at the rate of 400 to 600 square-feet per gallon.

g. To meet guarantee and to seal and dustproof, two (2) coats are required. For sealing new concrete, both coats shall be applied full-strength. On aged concrete, when renovating, dustproofing and sealing, the first coat should be thinned 10 to 15 percent (10-15%) with reducer per manufacturer's directions.

3.03 APPROVAL OF FINISHES

A. All concrete surfaces, when finished, will be inspected by the Engineer.

B. Surfaces which, in the opinion of the Engineer, are unsatisfactory shall be refinished or reworked.

C. After finishing horizontal surfaces, regardless of the finishing procedure specified, the concrete shall be cured in compliance with Section 03300, Cast-In-Place Concrete, unless otherwise directed by the Engineer.

3.04 SCHEDULE OF FINISHES

A. Concrete shall be finished as specified either to remain as natural concrete to receive an additional applied finish or material under another section.

B. Concrete for the following conditions shall be finished as noted on the Drawings and as further specified herein:

1. Concrete not exposed to view and not scheduled to receive an additional applied finish or material: Rough-form finish. See paragraph 3.01.F.

2. Vertical concrete exposed to view but not receiving any additional finish: Rubbed finish. See paragraph 3.01.G.

3. Vertical concrete in liquid containment areas except where special coating is required. Rubbed finish on exposed surfaces and extending to 2 feet below normal operating water level: Rough-form finish on remainder of submerged areas. See paragraph 3.01.G and 3.01.F.

4. Interior and exterior underside of concrete exposed to view but not receiving any additional finish: Rubbed finish. See paragraph 3.01.G.

5. Interior and exterior horizontal concrete not requiring floor sealer: Floated finish. See paragraph 3.02.A.

6. Concrete for exterior walks, interior and exterior stairs: Broomed finish perpendicular to direction of traffic. See paragraph 3.02.B.

7. Concrete slabs, concrete fill, or concrete topping in contact with process liquids or are in contact with sludge: Steel trowel finish. See paragraph 3.02.C.

8. Horizontal concrete to receive floor covering or tile flooring: Floated finish. See paragraph 3.02.A.

9. Concrete to receive floor sealer. See paragraph 3.02.D.

10. Concrete to be painted or coated with cementitious coating: Rough form finish. See paragraph 3.01.F.

11. Concrete to receive special coating, including underside of slab and walls above concrete fill in sludge tank: Abrasive blast. See paragraph 3.01.H.

12. Concrete tank bottoms or floors to be covered with concrete topping or grout: Broomed finish. See paragraph 3.02.B.

END OF SECTION

SECTION 03600

GROUT

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment, any incidentals required and install grout complete as shown in Drawings and as specified herein.

B. Furnish manufacturer or supplier certifications for all products and materials.

1.02 MATERIALS COMPLIANCE WITH AIS

A. P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), includes an “American Iron and Steel (AIS)” requirement in section 436 that requires Clean Water State Revolving Loan Fund (CWSRF) and Drinking Water State Revolving Loan Fund (DWSRF) assistance recipients to use iron and steel products that are produced in the United States for projects for the construction, alteration, maintenance, or repair of a public water system or treatment works. This Project meets the definition of such work, and the Environment Protection Agency (EPA) implementation requirements for this AIS requirement are outlined within the DWSRF memorandum titled “Implementation of American Iron and Steel provisions of P.L. 113-76, Consolidated Appropriations Act, 2014” included as part of the RLF Supplemental General Conditions.

B. All parties are required to comply with these requirements and to ensure that all qualifying iron and steel products used in this project must be produced in the United States. See RLF Supplemental General Conditions for additional details.

1.03 RELATED SECTIONS

A. Section 01300 – Submittals

B. Section 01450 – Field Quality Control

C. Section 03100 – Concrete Formwork

D. Section 03200 – Concrete Reinforcement

E. Section 03250 – Concrete Joints and Joint Accessories

F. Section 03300 – Cast-in-Place Concrete

G. Division 04 – Grout for Reinforced Masonry

H. Section 05500 – Miscellaneous Metal

1.04 REFERENCE STANDARDS

A. ASTM International (ASTM), latest edition:

1. ASTM C33 Standard Specification for Concrete Aggregates
2. ASTM C150 Standard Specification for Portland Cement
3. ASTM C476 Standard Specification for Grout for Masonry
4. ASTM C531 Standard Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical Resistant Mortars, Grouts, Monolithic Surfacings, and Polymer Concretes
5. ASTM C827 Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens from Cementitious Mixtures
6. ASTM C1019 Standard Test Method for Sampling and Testing Grout for Masonry
7. ASTM C1107 Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
8. ASTM D695 Standard Test Method for Compressive Properties of Rigid Plastics

B. The Masonry Society (TMS), latest edition:

1. TMS 402/602 Building Code Requirements and Specification for Masonry Structures and Companion Commentaries

1.05 DEFINITIONS

A. Non-shrink Grout: A commercially manufactured product that does not shrink in either the plastic or hardened state, is dimensionally stable in the hardened state, and bonds to a clean base plate.

1.06 SUBMITTALS

A. See Section 01300, Submittals for submittal procedures. Shop drawings, product data, materials of construction and installation details shall include the following:

1. Commercially manufactured non-shrink cementitious grout: The submittal shall include catalog cuts, technical data, storage requirements, product life, working time after mixing, temperature considerations, conformity to required ASTM Standards, and a Material Safety Data Sheet.
2. Commercially manufactured non-shrink epoxy grout: The submittal shall include catalog cuts, technical data, storage requirements, product life, working time after mixing, temperature considerations, conformity to ASTM Standards, and a Material Safety Data Sheet.

3. Cement grout: The submittal shall include the type and brand of cement, the gradation of the fine aggregate, product data on any proposed admixtures, and the proposed mix of the grout.

4. Concrete grout: The submittal shall include data as required for concrete as delineated in Section 03300, Cast-in-Place Concrete, and for fiber reinforcement as delineated in Section 03200, Concrete Reinforcement. This includes the mix design, constituent quantities per cubic-yard, and the water/cement ratio.

B. Samples

1. Samples of commercially manufactured grout products when requested by the Engineer.

2. Aggregates for use in concrete grout when requested by the Engineer.

C. Qualifications

1. Grout manufacturers shall submit documentation that they have at least 10 years' experience in the production and use of the type of grout which they propose to supply for the Work.

1.07 QUALITY ASSURANCE

A. Pre-Installation Conference

1. Well in advance of grouting, hold a pre-installation meeting to review the requirements for surface preparation, mixing, placing, and curing procedures for each product proposed for use. Parties concerned with grouting shall be notified of the meeting at least 10 days prior to its scheduled date.

B. Services of Manufacturer's Representative

1. A qualified field technician of the non-shrink grout manufacturer, specifically trained in the installation of the products, shall attend the pre-installation conference and shall be present for the initial installation of each type of non-shrink grout. Additional services shall also be provided, as required, to correct installation problems.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the jobsite in original, unopened packages, clearly labeled with the manufacturer's name, product identification, batch numbers, and printed instructions.

B. Store materials in full compliance with the manufacturer's recommendations. Total storage time from date of manufacture to date of installation shall be limited to six (6) months or the manufacturer's recommended storage time, whichever is less.

C. Material which becomes damp or otherwise unacceptable shall be immediately removed from the site and replaced with acceptable material at no additional expense to the Owner.

D. Non-shrink cement-based grout shall be delivered as pre-blended, pre-packaged mixes requiring only the addition of water.

E. Minimum time of grout workability shall be 30 minutes at ambient temperature.

F. Non-shrink epoxy grouts shall be delivered as pre-measured, pre-packaged, three component systems requiring only blending as directed by the manufacturer. Epoxy grout will not be used if exposed to a temperature exceeding 140°F.

G. Grout shall not contain gypsum, aluminum, or iron powder. Grout shall meet the shrinkage requirement of ASTM C883.

PART 2 PRODUCTS

2.01 GENERAL

A. The use of a manufacturer's name and product or catalog number is for the purpose of establishing the standard of quality desired.

B. Like materials shall be the products of one manufacturer or supplier in order to provide standardization of appearance.

2.02 MATERIALS

A. Non-shrink Cementitious Grout

1. Non-shrink cementitious grouts shall meet or exceed the requirements of ASTM C1107 Grades B or C. Grouts shall be Portland cement-based, contain a pre-proportioned blend of select aggregates and shrinkage compensating agents, and shall require only the addition of water. Non-shrink cementitious grouts shall not contain expansive cement or metallic particles. The grouts shall exhibit no shrinkage when tested in conformity with ASTM C827.

   a. General purpose non-shrink cementitious grout shall conform to the standards stated above and shall be SikaGrout 212 by Sika Corp.; Set Grout by Master Builders, Inc.; Gilco Construction Grout by Gifford Hill & Co.; Euco NS by The Euclid Chemical Co.; NBEC Grout by U. S. Grout Corp.; or approved equal.

   b. Flowable (Precision) non-shrink cementitious grout shall conform to the standards stated above and shall be Masterflow 928 by Master Builders, Inc.; Hi-Flow Grout by the Euclid Chemical Co.; SikaGrout 212 by Sika Corp.; Supreme Grout by Gifford Hill & Co.; Five Star Grout by U. S. Grout Corp.; or approved equal.

B. Non-shrink Epoxy Grout

1. Non-shrink epoxy-based grout shall be a pre-proportioned, three-component, 100 percent (100%) solids system consisting of epoxy resin, hardener, and blended aggregate. It shall have compressive strength of 14,000 psi in seven (7) days when tested in conformity with ASTM D695 and have a maximum thermal expansion of 30

x 10^{-6} when tested in conformity with ASTM C531. The grout shall be Ceilcote 648 CP by Master Builders, Inc.; Five Star Epoxy Grout by U. S. Grout Corp.; Sikadur 42 Grout-Pak by Sika Corp.; High Strength Epoxy Grout by The Euclid Chemical Co.; or approved equal.

C. Cement Grout

1. Cement grouts shall be a mixture of one part Portland cement conforming to ASTM C150 types I, II, or III and one to two parts sand conforming to ASTM C33 with sufficient water to place the grout. The water content shall be sufficient to impart workability to the grout but not to the degree that it will allow the grout to flow.

D. Water

1. Potable water, free from injurious amounts of oil, acid, alkali, organic matter, or other deleterious substances.

PART 3 EXECUTION

3.01 PREPARATION

A. Grout shall be placed over cured concrete which has attained its full design strength unless otherwise approved by the Engineer.

B. Concrete surfaces to receive grout shall be clean and sound; free of ice, frost, dirt, grease, oil, curing compounds, laitance, and paints, and free of all loose material or foreign matter which may affect the bond or performance of the grout.

C. Roughen concrete surfaces by chipping, sandblasting, or other mechanical means to ensure bond of the grout to the concrete. Remove loose or broken concrete. Irregular voids or projecting coarse aggregate need not be removed if they are sound, free of laitance, and firmly embedded into the parent concrete.

1. Air compressors used to clean surfaces with grout shall be the oil-less type or equipped with an oil trap in the air line to prevent oil from being blown onto the surface.

D. Remove all loose rust, oil or other deleterious substances from metal embedments or bottom of baseplates prior to the installation of the grout.

E. Concrete surfaces shall be washed clean and then kept moist for at least 24 hours prior to the placement of cementitious or cement grout. Saturation may be achieved by covering the concrete with saturated burlap bags, use of a soaker hose, flooding the surface, and other method acceptable to the Engineer. Upon completion of the 24-hour period, visible water shall be removed from the surface prior to grouting. The use of an adhesive bonding agent in lieu of surface saturation shall only be used when approved by the Engineer for each specific location of grout installation.

F. Epoxy-based grouts do not require the saturation of the concrete substrate. Surfaces in contact with epoxy grout shall be completely dry before grouting.

G. Construct grout or other leak-proof containment as required. Forms shall be lined or coated with release agents recommended by the grout manufacturer. Forms shall be of adequate strength, securely anchored in place and shored to resist the forces imposed by the grout and its placement.

H. Level and align the structural or equipment bearing plates in accordance with the structural requirements and the recommendations of the equipment manufacturer.

I. Equipment shall be supported during alignment and installation of grout by shims, wedges, blocks, or other approved means. The shims, wedges, and blocking devices shall be prevented from bonding to the grout by appropriate bond breaking coatings and removed after the grouting unless otherwise approved by the Engineer.

3.02 INSTALLATION – GENERAL

A. Mix, apply, and cure products in strict compliance with manufacturer's recommendations and these Specifications.

B. Have sufficient manpower and equipment available for rapid and continuous mixing and placing. Keep all necessary tools and materials ready and close at hand.

C. Maintain temperatures of the foundation plate, supporting concrete, and grout between 40°F and 90°F during grouting and for at least 24 hours thereafter or as recommended by the grout manufacturer, whichever is longer. Take precautions to minimize differential heating or cooling of baseplates and grout during the curing period.

D. Take special precautions for hot weather or cold weather grouting as recommended by the manufacturer when ambient temperatures or the temperature of the materials in contact with the grout are outside of the 60°F and 90°F range.

E. Install grout in a manner which will preserve the isolation between the elements on either side of the joint where grout is placed in the vicinity of an expansion or control joint.

F. Reflect all existing underlying expansion, control and construction joints through the grout.

3.03 INSTALLATION – CEMENT GROUTS AND NON-SHRINK CEMENTITIOUS GROUTS

A. Mix in accordance with manufacturer's recommendations. Do not add cement, sand, pea gravel or admixtures without prior approval by the Engineer.

B. Avoid mixing by hand. Mixing in a mortar mixer (with moving blades) is recommended. Pre-wet the mixer and empty excess water. Add a pre-measured amount of water for mixing, followed by the grout. Begin with the minimum amount of water recommended by the manufacturer and then add the minimum additional water required to obtain workability. Do not exceed the manufacturer's maximum recommended water content.

C. Minimize "shoulder" length (extension of grout horizontally beyond base plate). In no case shall the shoulder length of the grout be greater than the grout thickness.

D. Placements greater than 3-inches in depth shall include the addition of clean, washed pea gravel to the grout mix when approved by the manufacturer. Comply with the manufacturer's recommendations for the size and amount of aggregate to be added.

E. Place grout into the designated areas in a manner which will avoid segregation or entrapment of air. Do not vibrate grout to release air or to consolidate the material. Placement should proceed in a manner which will ensure the filling of all spaces and provide full contact between the grout and adjoining surfaces. Provide grout holes as necessary.

F. Place grout rapidly and continuously to avoid cold joints. Do not place cement grouts in layers. Do not add additional water to the mix (retemper) after the initial stiffening.

G. Just before the grout reaches its final set, cut back the grout to the substrate at a 45-degree (45°) angle from the lower edge of bearing plate unless otherwise approved by the Engineer. Finish this surface with a wood float (brush) finish.

H. Begin curing immediately after the form removal, cutback, and finishing. Keep grout moist and within its recommended placement temperature range for at least 24 hours after the placement or longer if recommended by the manufacturer. Saturate the grout surface by use of wet burlap soaker hoses, ponding or other approved means. Provide sunshades as necessary. If drying winds inhibit the ability of a given curing method to keep grout moist, erect wind breaks until wind is no longer a problem or curing is finished.

3.04 INSTALLATION – NON-SHRINK EPOXY GROUTS

A. Mix in accordance with the procedures recommended by the manufacturer. Do not vary the ratio of components or add solvent to change the consistency of the grout mix. Do not overmix. Mix full batches only to maintain proper proportions of resin, hardener and aggregate.

B. Monitor ambient weather conditions and contact the grout manufacturer for special placement procedures to be used for temperatures below 60°F or above 90°F.

C. Place grout into the designated areas in a manner which will avoid trapping air. Placement methods shall ensure the filling of all spaces and provide full contact between grout and adjoining surfaces. Provide grout holes as necessary.

D. Finish grout by puddling to cover all the aggregate and provide a smooth finish. Break bubbles and smooth surface of the grout in conformity with the manufacturer's recommendations.

E. Epoxy grouts are self-curing and do not require the application of water. Maintain the formed grout within its recommended placement temperature range for at least 24 hours after placing, or longer if recommended by the manufacturer.

3.05 SCHEDULE

A. The following list indicates where the particular types of grout are to be used:

1. General purpose non-shrink cementitious grout: Use at all locations where non-shrink grout is called for on the plans except for base plates greater in area than 3 feet wide by 3 feet long (3' x 3') and except for the setting of anchor rods, anchor bolts or reinforcing steel in concrete.

2. Flowable non-shrink cementitious grout: Use under all base plates greater in area than 3 feet by 3 feet (3' x 3'). Use at all locations indicated to receive flowable non-shrink grout by the Drawings. The Contractor, at his/her option and convenience, may also substitute flowable non-shrink grout for general purpose non-shrink cementitious grout.

3. Non-shrink epoxy grout: Use for the setting of anchor rods, anchor bolts, and reinforcing steel in concrete and for all locations specifically indicated to receive epoxy grout.

4. Cement grout: Cement grout may be used for grouting if incidental base plates for structural and miscellaneous steel such as post base platforms, base plates for beams, etc. It shall not be used when non-shrink grout is specifically called for on the Drawings or for grouting of primary structural steel members such as columns and girders.

END OF SECTION

SECTION 03740

MODIFICATION OR REPAIR OF EXISTING CONCRETE

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment required to modify or repair existing concrete as shown on the Drawings and as specified herein.

B. Work includes patching concrete, removal of anchor bolts or any embedment. Work under this section also includes bonding new concrete pours to existing/hardened concrete.

C. Work under this Section may be performed as a remedy for improperly placed or poorly placed concrete. Perform such work only after receiving written directions from the Engineer.

1.02 MATERIALS COMPLIANCE WITH AIS

A. P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), includes an “American Iron and Steel (AIS)” requirement in section 436 that requires Clean Water State Revolving Loan Fund (CWSRF) and Drinking Water State Revolving Loan Fund (DWSRF) assistance recipients to use iron and steel products that are produced in the United States for projects for the construction, alteration, maintenance, or repair of a public water system or treatment works. This Project meets the definition of such work, and the Environment Protection Agency (EPA) implementation requirements for this AIS requirement are outlined within the DWSRF memorandum titled “Implementation of American Iron and Steel provisions of P.L. 113-76, Consolidated Appropriations Act, 2014” included as part of the RLF Supplemental General Conditions.

B. All parties are required to comply with these requirements and to ensure that all qualifying iron and steel products used in this project must be produced in the United States. See RLF Supplemental General Conditions for additional details.

1.03 RELATED SECTIONS

A. Section 01300 – Submittals

B. Section 02316 – Structural Excavation, Backfilling and Grading

C. Section 03200 – Concrete Reinforcement

D. Section 03250 – Concrete Joints and Joint Accessories

E. Section 03300 – Cast-in-Place Concrete

F. Section 03600 – Grout

G. Section 05500 – Miscellaneous Metal

1.04 REFERENCE STANDARDS

A. ASTM International (ASTM), latest edition:

1. ASTM C109 Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens)

2. ASTM C881 Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete

3. ASTM C882 Standard Test Method for Bond Strength of Epoxy-Resin Systems Used With Concrete By Slant Shear

4. ASTM C883 Standard Test Method for Effective Shrinkage of Epoxy-Resin Systems used with Concrete (ASTM Standard Withdrawn, No Replacement)

5. ASTM D790 Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials

6. ASTM G109 Standard Test Method for Determining the Effects of Chemical Admixtures on Corrosion of Embedded Steel Reinforcement in Concrete Exposed to Chloride Environments

B. American Concrete Institute (ACI), latest edition:

1. ACI 301 Specifications for Concrete Construction

1.05 SUBMITTALS

A. See Section 01300, Submittals for submittal procedures. Submit shop drawings and product data showing materials of construction and details of installation for:

1. Bonding adhesives. Product data including catalog cuts, technical data, storage and handling requirements, product life, mixing and application instructions, temperature considerations, and conformity to ASTM or other standards specified. Submit Material Safety Data Sheets (MSDS) for all adhesives.

2. Patching materials. Product data including catalog cuts, technical data, storage and handling requirements, product life, mixing and application instructions, temperature considerations, and conformity to ASTM or other standards specified. Submit Material Safety Data Sheets (MSDS) for all patching materials.

B. Samples

1. Samples of adhesive capsule anchoring system if requested by the Engineer.

C. Design Data

1. Doweling adhesive: Submit manufacturer's load test data indicating bond and shear strengths for the types of reinforcement to be bonded to existing concrete.

D. Test Reports

1. Manufacturer's certified tests for adhesives, performed by an independent testing laboratory, indicating the following strength properties and the ASTM method used to determine each: Compressive strength, tensile, bond strength, modulus of elasticity, and shear strength.

2. Manufacturer's certified tests for patching materials, performed by an independent testing laboratory, indicating the following strength properties and the ASTM method used to determine each: Compressive strength, tensile strength, bond strength, modulus of elasticity, and shear strength.

E. Qualifications

1. Adhesive manufacturer: Demonstrate at least five (5) years of experience in the manufacture of products of the type to be provided. Document manufacturer's program for training and technically supporting field personnel.

2. Patching material manufacturer: Demonstrate at least five (5) years of experience in the manufacture of products of the type to be provided. Document manufacturer's program for training and technically supporting field personnel.

1.06 QUALITY ASSURANCE

A. Qualifications

1. Applicator: Firm specializing in concrete repair approved by the materials manufacturer.

2. Manufacturer: The manufacturer of the products specified shall have not less than five (5) years of documented experience in the manufacture of such products and shall have an ongoing program to provide training and technical support for the Contractor's personnel.

1.07 SYSTEM DESCRIPTION

A. Modify and repair concrete at locations shown on the Drawings and specified.

B. The Engineer may, from time to time, direct the Contractor to make additional repairs to existing concrete. Make such repairs as specified or by other methods as may be directed by the Engineer. Payment for such repairs will be in compliance with the General Conditions of these Specifications.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Clearly and indelibly mark all containers with the manufacturer's name, manufacturer's product identification, manufacturer's instructions for mixing, and warnings for handling and toxicity.

B. Deliver materials in sealed containers with labels legible and intact.

C. Storage should be made in a suitable clean and dry location approved by the Engineer.

D. Store all materials in full compliance with the manufacturer's storage instructions.

E. Handle materials in a safe manner. Avoid breaking container seals.

F. Components should not be mixed until necessary preparatory work is completed and application work will start immediately.

1.09 PROJECT SITE REQUIREMENTS

A. Environmental Requirements

B. Comply fully with manufacturer's recommendations as to the environmental conditions under which the products of this Section may be placed.

PART 2 PRODUCTS

2.01 GENERAL

A. The use of a manufacturer's name and model or catalog number is for the purpose of establishing the standard of quality and general configuration desired.

B. Similar materials shall be the end products of one (1) manufacturer in order to provide standardization for appearance.

C. Materials shall comply with these Specifications and any federal, state, or local regulations.

2.02 ADHESIVES FOR BONDING PLASTIC CONCRETE TO HARDENED CONCRETE

A. Cement Slurry

1. Cement slurry shall be water and Portland cement, both as specified in 03300, Cast-in-Place Concrete mixed to a heavy paste. Cement slurry shall not contain fly ash.

B. Solvent-Free Polymer Adhesives

1. Epoxy Adhesives

a. Epoxy adhesive shall be a two-component, solvent-free, asbestos-free, moisture-insensitive epoxy resin material conforming to the requirements of ASTM C881.

b. Curing temperature requirements (Class) and viscosity (Grade) shall be determined by supplier and Contractor after project conditions have been established.

c. Material type: Type V – for load bearing applications bonding freshly mixed concrete to hardened concrete.

d. Epoxy adhesive bonding systems shall conform to the preceding requirements and shall be Sikadur series by Sika Corporation, Lyndhurst, New Jersey, or approved equal.

2.03 ADHESIVES FOR BONDING INSERTS INTO CONCRETE

A. Doweling adhesive shall be a two-component vinyl ester blend system supplied in single cartridges separating the resin from the hardener, and capable of dispensing an accurately proportioned adhesive mixture.

1. Doweling adhesive shall be HY-200 Cartridge by Hilti Corporation, Tulsa, Oklahoma; Set 3G by Simpson Strong Tie Company, Pleasanton, California; AC200+ by DeWalt, Towson, Maryland; or approved equal.

2.04 PATCHING MATERIALS

A. Repair Mortars

1. Cementitious Mortar

a. Cementitious mortar shall be a polymer-modified, Portland cement, two-component, fast setting, easy tooling patching mortar, with an integral corrosion inhibitor.

b. Cementitious mortar shall conform to the preceding requirements and shall be Sika-Top series by Sika Corporation; Masterpatch series by Master Builders Technologies; or approved equal.

PART 3 EXECUTION

3.01 GENERAL

A. Cut, repair, or otherwise modify existing concrete as indicated on the Drawings, as specified, and as may be required by Contractor's error. Work shall comply with the requirements of this Section and other requirements as noted on the Drawings.

B. No existing concrete shall be shifted, cut, removed, or otherwise altered until authorization has been received from the Engineer.

C. When removing materials, or when repairing concrete elements, take all necessary precautions and erect barriers, shoring, bracing, or other protective devices as required to prevent damage to areas beyond the limits of the work and to protect personnel.

D. Locate penetrations drilled or cored into existing concrete to avoid existing reinforcement whenever possible. Where possible, identify reinforcement locations prior to drilling and adjust the locations of holes to avoid interference. Advise Engineer of any locations where reinforcement has been cut.

E. Mechanically clean existing exposed reinforcement or concrete embedments to remove contaminants and rust before proceeding with any concrete modification or repair.

1. Where existing reinforcement is shown to be salvaged for incorporation into new or repaired construction, carefully remove the existing concrete surrounding it, and cut, bend, or lap such bars as shown on the Drawings to provide not less than 1 inch of concrete cover between such reinforcement and the exposed surface of the concrete.

2. If more than half the diameter of any reinforcement is exposed, chip out the concrete behind that reinforcement to a depth of not less than 1/2 inch in preparation for placing concrete repair materials around it.

F. Where concrete is to be repaired in the vicinity of a control, expansion, or isolation joint, make repairs so as to preserve the line of and isolation across the joint.

3.02 REMOVING CONCRETE

A. Remove designated concrete by line drilling at the limits and then chipping or jackhammering as appropriate within the areas where the concrete is to be removed. Exercise caution to ensure that surrounding equipment or concrete, and existing reinforcement to be left in place, is not damaged. Sawcutting at the limits of concrete removal will be permitted only where specifically indicated on the Drawings or approved by the Engineer.

B. At all concrete removals where joints between new and existing concrete will be exposed to view the finished work, the edge of the concrete removal shall be made using a 1-inch-deep saw cut on the exposed surface of the existing concrete. Maintain this edge undamaged during removal of adjacent concrete.

C. All saw-cut edges shall be straight, and cuts shall intersect at a right angle.

D. Where existing reinforcement is exposed by removal of concrete and would not normally be protected by new concrete placed against it, coat the exposed surface using epoxy repair mortar, with a thickness of 1/4 inch, should be applied over the entire cut surface of the existing concrete.

E. Concrete to be left in place, which is damaged by the Contractor, shall be repaired to the satisfaction of the Engineer using approved means.

3.03 BONDING OR REPAIRING CONCRETE

A. Where new concrete is to be placed against existing concrete, bonding adhesive shall be applied to the surface of the existing concrete. Install type called out on Drawings or by referring to schedule.

B. Dry, finished surfaces of repaired concrete shall match the color and texture of the adjoining concrete to the greatest extent possible.

C. Preparation of Concrete Surfaces

1. Protect surfaces beyond the limits of bonding and repairs, against damage, abrasion, or spillage.

2. Concrete surfaces to which bonding or repair materials will be applied shall be newly exposed parent concrete, free of loose and unsound materials. Prepare surfaces by mechanical abrasion unless prohibited by environmental limitations. Prepared surfaces shall be sound, with coarse aggregate exposed, and free of any deleterious materials such as laitance, curing compounds, dust, dirt, or oil. Irregular voids or surface stones need not be removed if they are sound and firmly embedded into the parent concrete. Materials resulting from surface preparation techniques shall be removed.

   a. Mechanically abrade surfaces by sandblasting, scarifying, waterblasting, or other means approved by the Engineer. Roughen the existing surface to a minimum amplitude (distance between high and low points) of 1/4 inch.

3. In areas where reinforcing steel bars are exposed, concrete shall be removed to a minimum of 1 inch around the bars. If reinforcing steel is cut through or the cross-section area of steel bars are reduced by more than 25 percent (25%) of its original dimension, the Engineer shall be notified immediately.

4. Concrete surfaces to be bonded or repaired shall be dry unless water-insensitive cementitious products are used.

   a. Evaluate moisture content of concrete by determining if moisture will collect at bond lines between old concrete and adhesives or repair materials before the latter have cured. Test by taping a 4-foot by 4-foot (4' x 4') polyethylene sheet to the concrete surface. If moisture collects under the sheet before bonding or repair products would cure, allow the concrete additional drying time before placing them.

5. Where plastic concrete is to be bonded to hardened concrete, surfaces shall have a moisture content not exceeding saturated surface dry condition.

6. Surface temperature of the concrete shall be within the limits recommended by the manufacturer for the particular product to be used, but in no case shall the surface temperature be below 40° F.

7. The area of concrete to be treated shall be cut to a minimum of 1/2 inch and a maximum depth that results in no damage to reinforcing steel. Existing concrete shall be chipped so that the minimum repair mortar thickness is 1/2 inch.

D. Bonding and Repairing Procedures

1. Product Preparation

a. Condition components as recommended by the manufacturer prior to mixing.

b. Mix components in a clean container free of harmful residue or foreign particles.

c. Thoroughly blend components with a mechanical mixer to a uniform and homogeneous mixture. Mix small batches (up to 1 quart) using spatulas, knives, or similar implements.

2. Application of Adhesives

a. Apply adhesive to concrete using equipment recommended by the manufacturer for the applications and products being used.

b. Place fresh plastic concrete within contact time of adhesive as recommended by the manufacturer. If epoxy adhesive cures to extent of losing its tack before plastic concrete is in contact with adhesive, remove or slightly abrade the first coat before placing any additional coat.

c. Consolidate freshly placed plastic concrete in accordance with ACI 301 and ensure full bonding to existing concrete. At the completion of finishing operations, cure concrete in accordance with the provisions of Section 03300, Cast-in-Place Concrete.

3. Application of Repair Mortar

a. Apply repair mortar to concrete surface by trowel or screed. Thickness shall be maintained within the limits recommended by the manufacturer.

b. After initial mixing of mortar, extra water should not be added to increase mortar workability.

c. Work mortar into place and consolidate thoroughly so that all contact surfaces are wet by the mortar, and entrapped air is reduced to the level recommended by the manufacturer.

d. Finish mortar surface to texture, color, and smoothness required for the specific application. Repair mortar shall receive a smooth, steel trowel finish.

e. Upon completion of finishing operations, protect and allow mortar to cure in accordance with manufacturer's recommendations.

4. Cleanup

a. Immediately remove any adhesive or repair materials applied or spilled beyond the desired area using materials designated by the adhesive manufacturer. Avoid contamination of the work area.

b. Repair mortar shall be cured according to the repair mortar manufacturer recommendations.

5. Field Testing

a. The Engineer will evaluate the bonding of plastic concrete to hardened concrete after the plastic concrete has cured for not less than 28 days. First evaluation will be made by sounding methods.

b. Detection of a hollow sound in any area shall be reason to suspect inadequate bonding. When requested by the Engineer, the Contractor shall core any such areas to determine the adequacy of bond. Length of cores shall be twice the core diameter or twice the thickness of the new concrete as requested by the Engineer.

c. Cores shall be visually observed. If the bond is adequate, costs of coring shall be borne by the Owner. If the bond is inadequate, costs of coring and any repairs ordered by the Engineer shall be borne by the Contractor.

3.04 BONDING INSERTS INTO EXISTING CONCRETE

A. Drill hole of diameter and depth recommended by the doweling adhesive manufacturer to develop the full yield strength for the dowel to be embedded. Clear dust and debris and place doweling adhesive in hole according to manufacturer's recommendations. Locate dowel in hole to provide the indicated embedment and projection. Insert the dowel slowly, tapping it into the full depth of the hole and turning it slightly to fill voids in adhesive. Do not disturb or load the dowel before adhesive cure time is complete.

B. Waterstops between existing and new concrete:

1. Refer to Section 03250, Concrete Joints and Joint Accessories, paragraph 3.01B

3.05 SCHEDULES

A. The following are specific concrete surface preparation and bonding "methods" to be used where indicated on the Drawings or specified, or where directed by the Engineer:

1. Method A – Cement slurry bond: Prepare the existing concrete surface at the connection as specified in paragraph 3.03C. Brush on to the connection surface a 1/16-inch layer of cement slurry mixed to the consistency of a heavy paste. Immediately place new plastic concrete or grout mixture against the slurry and existing concrete.

2. Method B – Adhesive bond: Prepare the existing concrete surface at the connection as specified in paragraph 3.03C. Apply epoxy adhesive to the connection surface unless another adhesive is specified on the Drawings. Place new plastic concrete while the adhesive remains tacky.

3. Method C – Embedment of dowels, bolts or threaded rods: Drill a hole of diameter and depth as required. Clean hole of loose particles and dust using compressed air. Fill hole with and butter the steel insert member to be inserted with epoxy paste so

that when the steel insert is installed, the epoxy paste will fill the hole. Insert the steel member, tapping it into the full depth of the hole. Unless otherwise shown on the Drawings, deformed bars shall be drilled and set to a depth of at least 12 bar diameters and smooth bars shall be drilled and set to a depth of at least 15 bar diameters. The depth of the drilled holes shall not exceed the thickness of the member minus 3 inches. The Engineer will provide details regarding the size and spacing of the steel embeds where not noted on the Drawings.

4. Method D – Adhesive bond with embedded dowels: Combine Methods B and C.

END OF SECTION

SECTION 03800

CONCRETE ELECTRICAL DUCT ENCASEMENT

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment, and incidentals required and place concrete encasement around underground electrical ductwork as shown on the drawings and specified herein.

1.02 MATERIALS COMPLIANCE WITH AIS

A. P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), includes an “American Iron and Steel (AIS)” requirement in section 436 that requires Clean Water State Revolving Loan Fund (CWSRF) and Drinking Water State Revolving Loan Fund (DWSRF) assistance recipients to use iron and steel products that are produced in the United States for projects for the construction, alteration, maintenance, or repair of a public water system or treatment works. This Project meets the definition of such work, and the Environment Protection Agency (EPA) implementation requirements for this AIS requirement are outlined within the DWSRF memorandum titled “Implementation of American Iron and Steel provisions of P.L. 113-76, Consolidated Appropriations Act, 2014” included as part of the RLF Supplemental General Conditions.

B. All parties are required to comply with these requirements and to ensure that all qualifying iron and steel products used in this project must be produced in the United States. See RLF Supplemental General Conditions for additional details.

1.03 RELATED SECTIONS

A. Section 01300 – Submittals

B. Section 02140 – Dewatering and Drainage

C. Section 02316 – Structural Excavation, Backfilling and Grading

D. Section 03200 – Concrete Reinforcement

E. Section 03250 – Concrete Joints and Joint Accessories

F. Section 03300 – Cast-in-Place Concrete

1.04 SUBMITTALS

A. See Section 01300, Submittals for submittal procedures. Submit product data and installation details per Section 03300, Cast-in-Place Concrete. Product data shall include the following:

1. Colored pigment additive

2. Plastic warning tape (when indicated on the Drawings)

PART 2 PRODUCTS

2.01 MATERIALS

A. Provide Class A concrete as specified in Section 03300, Cast-in-Place Concrete. Red liquid dye concentrate, similar or equal to Sika-USA Scofield Formula One, shall be applied to the top of the duct bank at a rate of one (1) diluted gallon per three hundred (300) square-feet.

PART 3 EXECUTION

3.01 GENERAL

A. Concrete shall be measured, mixed, and placed, and compacted as required in Section 03300, Cast-in-Place Concrete for Class A concrete and as specified below.

B. Provide not less than 4 inches of concrete between the outside of a duct and the earth. Provide not less than 2 inches of concrete between adjacent ducts.

C. All duct line concrete pours shall be continuous between manholes or handholes and between manholes or handholes and structures.

D. Where duct lines pass through concrete walls, concrete envelopes shall be extended through and finished flush with inside surfaces. Watertight construction joints of an approved type shall be provided (see Section 03250, Concrete Joints and Joint Accessories).

E. Duct lines shall be laid in trenches on mats of gravel not less than 6 inches thick and well graded.

F. Duct lines may be cast against well shaped earth trenches that are able to support the placement and consolidation of the concrete. Forms shall be used where the earth trenches cannot support the construction and placement of the concrete or where the duct lines cross exposed openings.

G. Concrete placed for duct banks shall be field tested in accordance with Section 03300, Cast-in-Place Concrete.

H. The top of the concrete duct encasement shall be screeded smooth and level.

I. The minimum soil cover for duct banks shall be 24 inches.

END OF SECTION